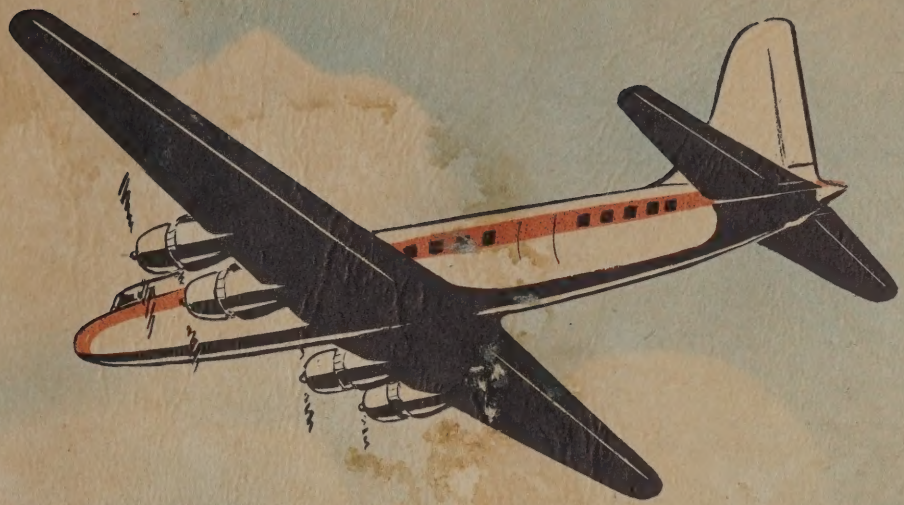
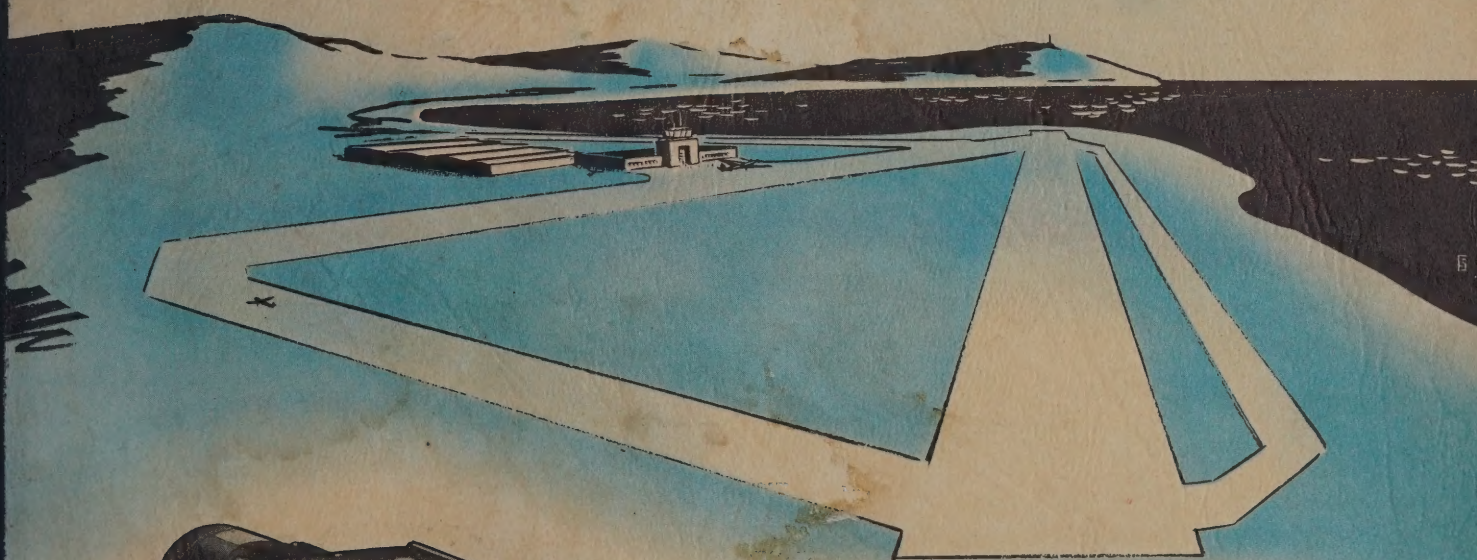
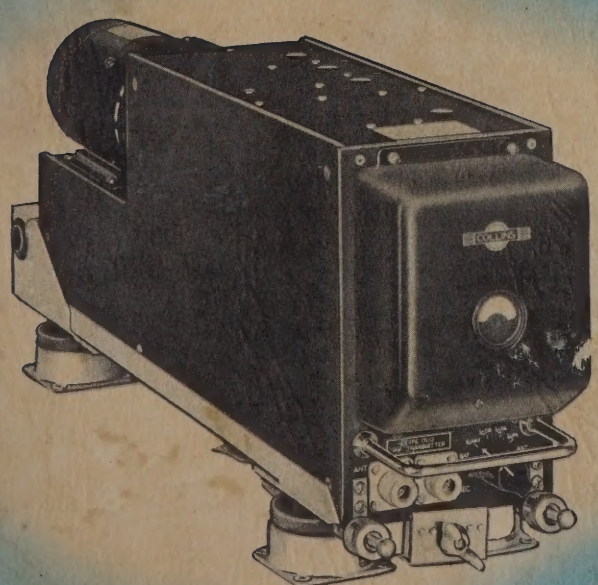


INSTRUCTION BOOK





17L-3

VHF AIRCRAFT TRANSMITTER

COLLINS

INSTRUCTION BOOK

FOR

17L-3 VHF AIRCRAFT TRANSMITTER

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

520 9754 00
1 June 1953

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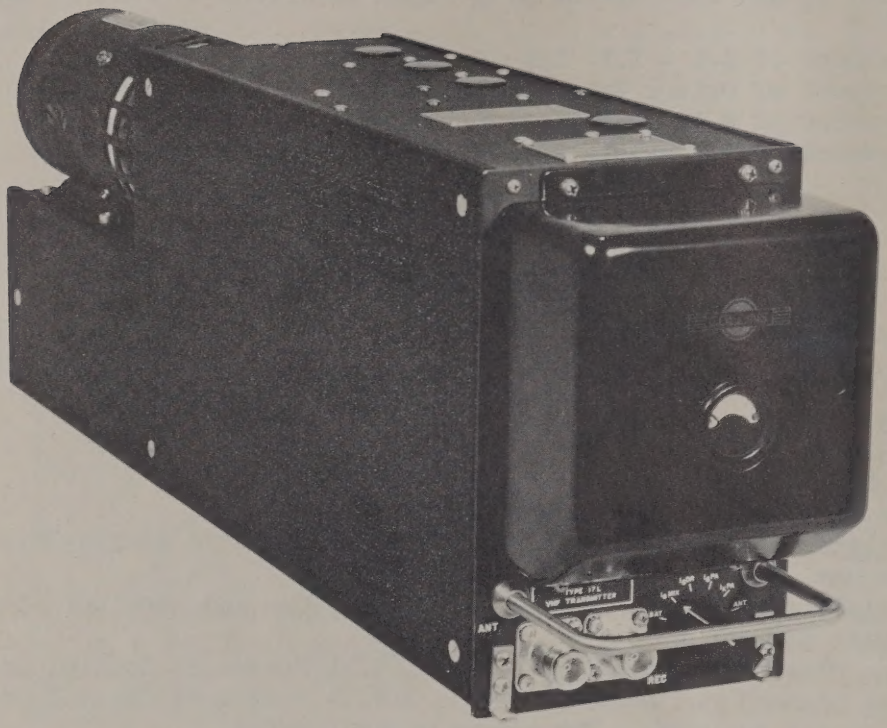


Figure 1-1 Type 17L-3 VHF Transmitter

SECTION I

GENERAL DESCRIPTION

1. PURPOSE OF BOOK - MODEL COVERED.

This instruction book describes the Collins 17L-3 VHF Transmitter and associated equipment, its installation, operation, theory of operation and maintenance.

2. EQUIPMENT SUPPLIED.

Name of Unit	Overall Dimensions (Inches)	Weight (lbs)
Type 17L-3 VHF Transmitter complete with dynamotor, tubes and crystals for 118.0-131.9 mc operation	22-1/4 L x 5 W x 7-3/4 H	22 lb. 8 oz.

3. ACCESSORIES.

3.a. The following accessories have been designed for use with the 17L-3 VHF Transmitter. The accessory equipment required for a particular installation depends upon the type of receiving equipment to be used and the type of frequency selecting facilities desired.

Name of Unit	Overall Dimensions (Inches)	Weight (lbs)
Type 314Y-1 Frequency Control Unit	3-1/2 L x 2-1/4 W x 3-1/2 H	0 lb. 10 oz.
Type 314U-4 Frequency Control Unit	4-1/4 L x 2-1/4 W x 3-1/2 H	0 lb. 13 oz.
Type 68U-1 Coaxial Relay	3-1/2 L x 3-3/4 W x 4-1/8 H	4 lb. 2 oz.
Shockmount for 17L-3 VHF Transmitter, Collins Part No. 504 4272 001	23-1/2 L x 5-3/8 W x 4 H	2 lb. 10 oz.
Dual-Unit Shockmount for 17L-3 VHF Transmitter and 51R VHF Navigation-Communications Receiver, Collins Part No. 505 2679 004	23-1/2 L x 11-1/2 W x 4 H	4 lb. 10 oz.

3.b. Variable quantities of the following are required to complete installation of the 17L-3 VHF Transmitter. Quantities of connectors and length of cable required are dependent upon the installation.

Name of Unit	Required Characteristics
Type N constant-impedance plugs	Type UG-21/U or equivalent
Type UHF plug	Type PL-259 or PL-259A (for antenna)
Microphone	T-17 or equivalent carbon aircraft microphone with push-to-talk switch
Headset	HS-23, HS-33, or equivalent
Radio Frequency Cable	Type RG-8/U or equivalent 52 ohm cable
Antenna	Collins type 37R or equivalent

4. DESCRIPTION OF EQUIPMENT

4.a. 17L-3 VHF Transmitter - The 17L-3 Transmitter is an airborne multichannel transmitter designed for VHF air-to-ground communication in the frequency range 118.0 to 135.9 mc. This transmitter has been designed for use with the Collins 51R VHF Receiver, or other receiver, to provide a complete communication system for air carrier or executive type aircraft. The 180 channel frequencies available are controlled by a frequency multiplication and addition system employing quartz crystals.

The audio circuits are designed to operate from a carbon microphone to provide amplitude-modulated radio telephony service with a nominal r-f power output of 8 watts. A sidetone signal is provided for monitoring purposes.

This transmitter has been designed to operate with remote control of frequency selection and all other functions. The Collins Autopositioner system is employed to provide automatic frequency selection and tuning. An antenna change-over relay and a dynamotor power supply are included within the transmitter case. When the transmitter is used in conjunction with a Collins 51R Receiver, the transmitter power supply will furnish the necessary voltages for the receiver for communication service. The transmitter and power supply are contained in a single 1/2 ATR case. Removable side panels aid maintenance operations by giving ready access to tubes, crystals, relays, etc. A removable front cover provides access to the Autopositioner tuning mechanism and sidetone level control. All power and control connections are made by means of a multi-contact connector that is mounted on the rear of the case. Antenna and receiver antenna connections are made by means of Type N connectors on the transmitter front panel.

Figure 1-2 Type 314Y-1 Frequency Control Unit

Figure 1-3 Type 314U-4 Frequency Control Unit

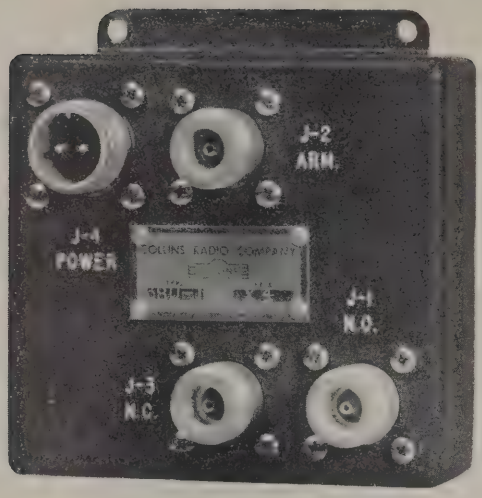


Figure 1-4 Type 68U-1 Coaxial Relay

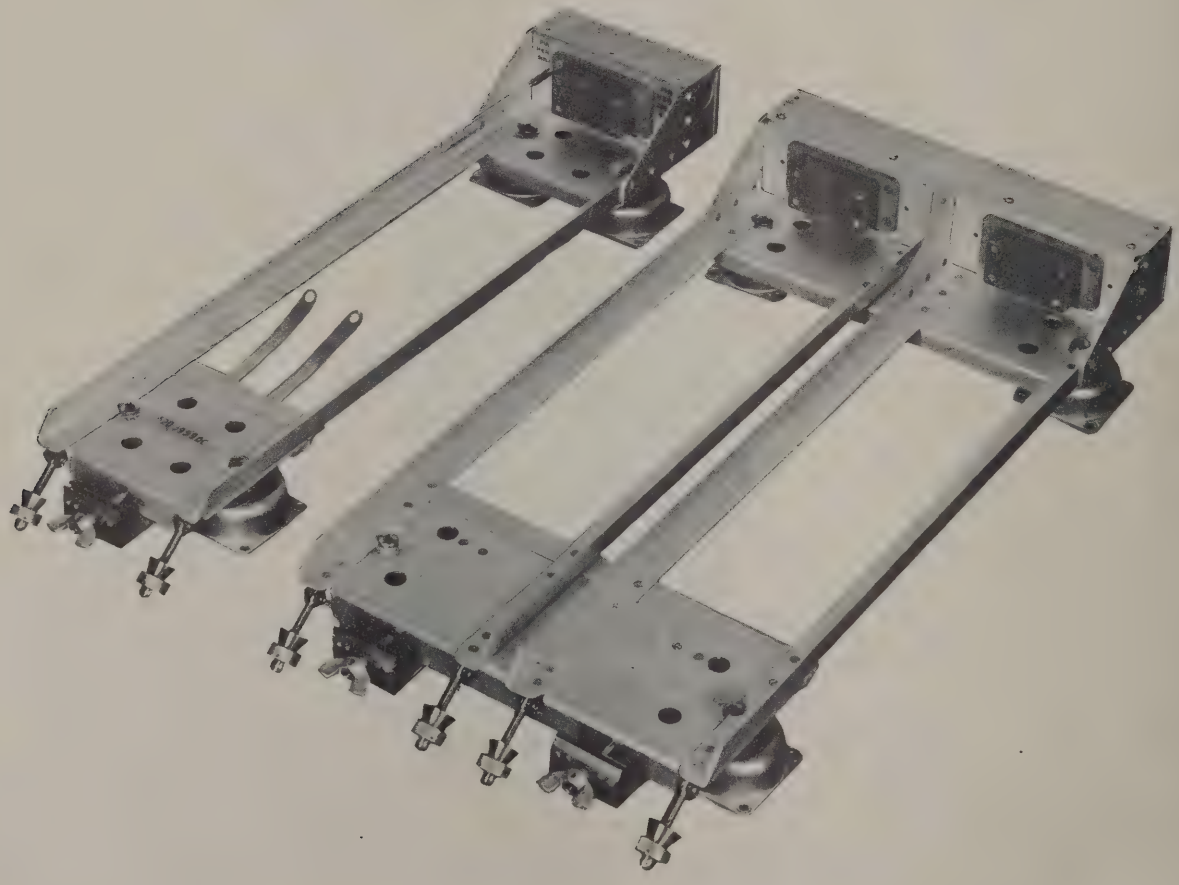


Figure 1-5 Single and Dual Unit Shockmounts

4.b. Frequency Control Units - Two frequency control units are available for use with the 17L-3 Transmitter. By the use of the transmitter, a 51R Receiver and the appropriate Control Units, any one of several types of remote frequency selection systems may be used. The system selected will be dependent upon the type of operation desired. The following combinations are available.

(1) Simplex Operation (Send and receive on same frequency) - Control of transmitter and receiver from a single frequency selector (Type 314U-4)

(2) Simplex or Duplex (Cross band) - Control of transmitter and receiver from separate selectors (Types 314Y-1 or 314U-5)

(3) Joint or Separate Frequency Selection - Control using two frequency selectors and a transfer switch (Type 314U-4 and 314U-5).

(a) The 314Y Frequency Control Unit is a vertically mounted selector designed to work with the 17L Transmitter to provide remote selection of frequency. This unit includes two coaxial switch sections. The dial markings of the knobs that are associated with these switches are combined to read directly in frequency. The dial markings are illuminated by a self-contained panel lamp. Mechanical stops are provided to permit limiting of the rotation of the megacycle selecting switch when a reduced frequency range is used.

(b) The 314U-4 Frequency Control Unit is similar to the 314Y but is designed to provide simultaneous control of both the 17L-3 Transmitter and the 51R Receiver. The range of the dials on this control unit is from 108.0 to 135.9 mc. When a frequency in the range 118.0 to 135.9 mc is selected, both the transmitter and receiver are tuned to operate on the frequency selected. When a frequency in the 108.0 to 117.9 mc range is selected, the transmitter is automatically disabled. Special wiring and an additional relay within the transmitter are required when it is necessary to use the receiver on frequencies below 118.0 mc.

(c) The 314U-5 Frequency Control Unit and other units designed for use with the 51R Receiver are described in the instruction books that cover these equipments.

4.c. Type 68U-1 Coaxial Relay - The 68U-1 Coaxial Relay is a Price Electric Corporation Series 6300 coaxial relay mounted in a small metal box to simplify installation in aircraft. This relay connects the receiver to the proper antenna, depending upon whether horizontally polarized navigation signals or vertically polarized communication signals are being received.

4.d. Shockmounts - Either of two shockmounts may be used for mounting the 17L-3 Transmitter. A single-position shockmount is available for use when the Collins 51R Receiver will not be used. If the complete communication system, consisting of the 17L-3 Transmitter and a 51R Receiver, is to be installed, the dual shockmount will be required. The single shockmount is Collins Radio Part No. 504 4272 001. The dual shockmount is Collins Part No. 505 2679 004.

These shockmounts are equipped with multi-contact connectors through which power and control connections can be made. A thumbscrew operated extractor mechanism simplifies the removal of the equipments from the shockmounts.

5. PERFORMANCE SPECIFICATION - 17L-3 VHF TRANSMITTER.

5.a. Power Output - eight watts nominal into 52 ohm resistive load.

5.b. Modulation Capability - Up to 90% modulation from carbon microphone.

5.c. Modulation Fidelity - Within 6 db from 300 to 4000 cps. Distortion at 1000 cps 70% modulation-less than 12%.

5.d. Frequency Stability - 0.007% stability under service conditions; i.e., from -55°C to +50°C, humidity up to 95%, supply voltage variations ±10%.

5.e. Sidetone Output - Sidetone output 100 milliwatts into 500 ohms - adjustable.

5.f. Power Requirements - Nominal Voltage - 27.5 V DC.

Current Requirements: Standby - 1.5 amp.
Transmit - 9.5 amp.

6. TUBE COMPLEMENT.

Quantity	Type
7	6AK5 or 5654
2	6AR5
2	6V6
1	12AU7
1	832A

SECTION II

INSTALLATION AND ADJUSTMENT

1. GENERAL INSTRUCTIONS.

1.a. Unpacking - Remove all packing material and lift units out carefully. Inspect for damage. Be sure all controls work properly. All claims for damage in shipment must be filed promptly with the transportation company. If claims for damage are to be filed, the original packing cases and material should be preserved.

1.b. The 17L-3 VHF Transmitter and accessory equipment can be installed in any of several different systems. The type of installation depends upon the receiver and receiver power supply to be employed and the type of frequency control system desired. The following paragraphs outline the installation procedure.

2. LOCATION AND MOUNTING OF TRANSMITTER.

2.a. Choosing Location - The transmitter should be located in a position that is reasonably accessible and well ventilated. Adequate clearance for the mounting of the transmitter on its shockmount must be provided. Access to the front panel is necessary to permit removal of the transmitter from the shockmount and to permit checking operation of the transmitter by observing the panel meter.

2.b. Mounting - The transmitter is contained in a single 1/2 ATR unit case (JAN-A-1-d). The unit may be mounted on a single shockmount or with a companion receiver on a dual unit mount. The dual unit mount is recommended for use whenever practical because it provides more stable mounting and reduces the amount of exterior inter-unit cabling required. Figure 2-1 shows the outline and mounting dimensions of the transmitter mounted on a single-unit shockmount. Figure 2-2 shows a transmitter and a 51R Receiver mounted on the dual-unit shock mount. Note that all power and control connections are made through the rear mounted connectors and that the antenna connections are made by means of Type N connectors on the front panels.

(1) The shockmount should be secured to the radio shelf by means of No. 10 screws, nuts and lock washers. Note that the clearance holes in the rear panel of the shockmount permit the rear connectors to be removed or installed after cable wiring has been completed.

(2) To install the 17L-3 Transmitter on the shockmount -

(a) Operate the extractor mechanism by rotating the thumbscrew as far as possible in a counter-clockwise direction.

(b) Place the transmitter on the shockmount and push toward the rear so that the front panel drops into the extractor slot.

(c) Rotate the thumbscrew clockwise until the rear connectors are fully engaged.

(d) Engage, tighten and safety-wire the hold-down clamps.

NOTE

WHEN REMOVING THE 17L-3 TRANSMITTER OR 51R RECEIVER FROM THIS SHOCKMOUNT BY USING THE EXTRACTOR MECHANISM, BE SURE THAT THE HOLD-DOWN CLAMPS ARE DISENGAGED BEFORE ROTATING THE EXTRACTOR THUMBSCREW.

3. MOUNTING OF CONTROL UNITS.

3.a. Selecting Control Unit - Two types of frequency control units have been designed for use with the 17L-3 Transmitter. The 314Y Control Unit provides control of the transmitter only and is used when a 51R Receiver is not a part of the installation or where independent control of the transmitter frequency is desired to permit cross-band operation. The 314U-4 Control Unit provides combined control of the 17L-3 Transmitter and a 51R Receiver for Simplex operation (Transmitter and receiver set to same frequency). Except for the depth behind the panel, mounting details of the two units are identical. Figures 2-3 and 2-4 show outline and mounting dimensions of these control units.

3.b. Mounting - The control unit may be mounted in either of two ways. The control unit may be mounted to the rear of the radio control panel using the front panel supplied and layout A of figure 2-5 or as an alternate the controls may be mounted as an integral part of the radio control panel in the plane. If the second method is used, the front panel supplied with the control unit should be discarded and layout B of figure 2-5 used.

3.c. Stop Pins - The stop pins that are installed in the megacycle selector knob are designed for use with a panel 1/16 inch thick. If a thicker panel is used special stop pins must be installed. The 314Y-1 Control Unit is normally supplied with the stops set so as to cover the frequency range 118.0 to 131.9 mc. The 314U-4 Control Unit is normally supplied with the stops set to cover the frequency range 108.0 to 131.9. Both units can be modified to extend the range to 135.9 mc by removing the stop pins.

4. 68U-1 COAXIAL RELAY.

Figure 2-6 shows the outline and mounting dimensions of this coaxial relay assembly. Mount the unit on a flat surface using 6-32 screws, nuts and lock washers.

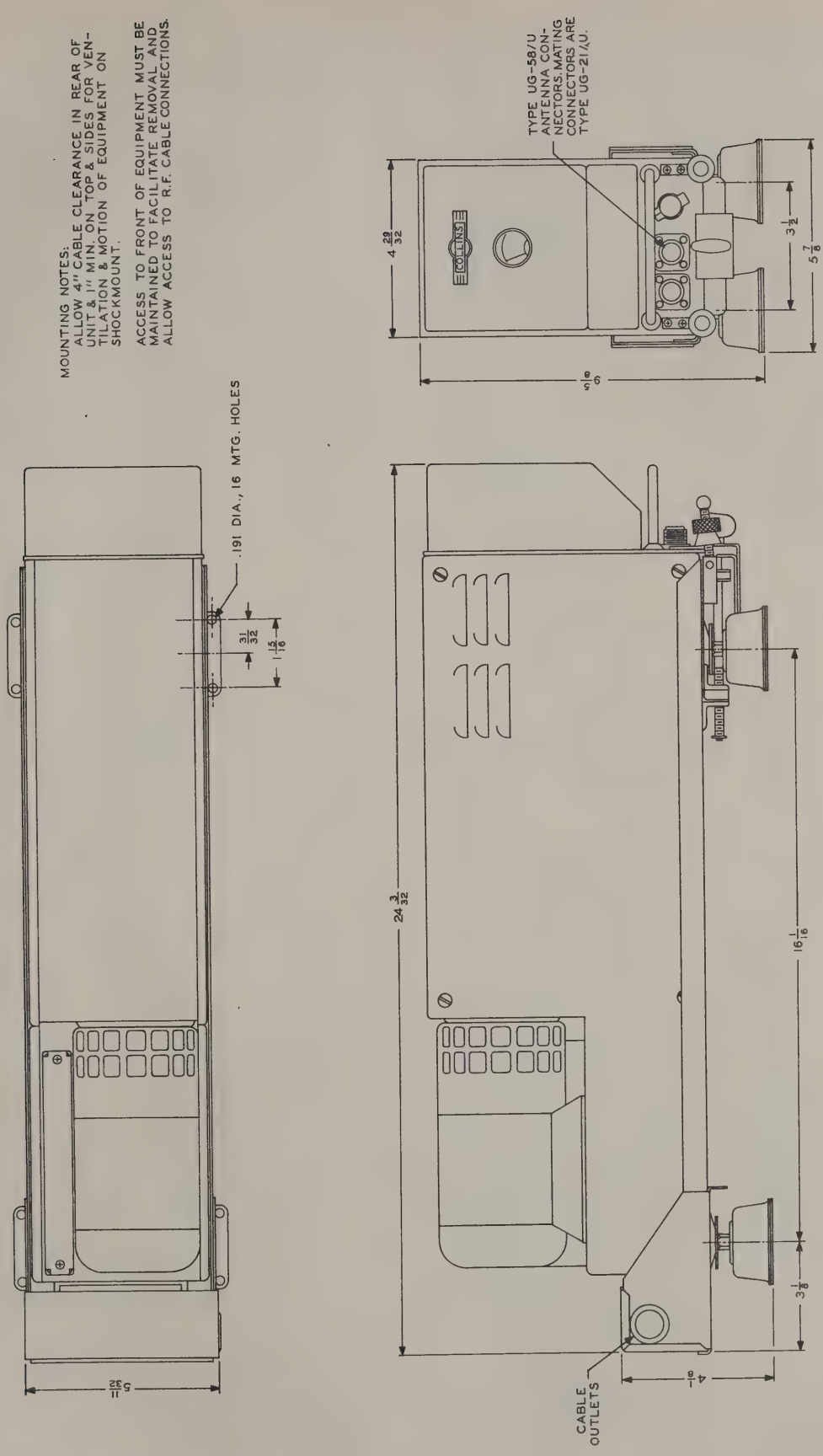

MOUNTING NOTES:
ALLOW 4" CABLE CLEARANCE IN REAR OF UNIT & 1" MIN. ON TOP & SIDES FOR VENTILATION & MOTION OF EQUIPMENT ON SHOCKMOUNT.
ACCESS TO FRONT OF EQUIPMENT MUST BE MAINTAINED TO FACILITATE REMOVAL AND ALLOW ACCESS TO R.F. CABLE CONNECTIONS.
TYPE UG-58/U ANTENNA CONNECTORS. MATING CONNECTORS ARE TYPE UG-21/U.
.191 DIA., 16 MTG. HOLES
COLLINS
CABLE OUTLETS

Figure 2-1 Installation Drawing - Type 17L-3 Transmitter with Single-Unit Shockmount

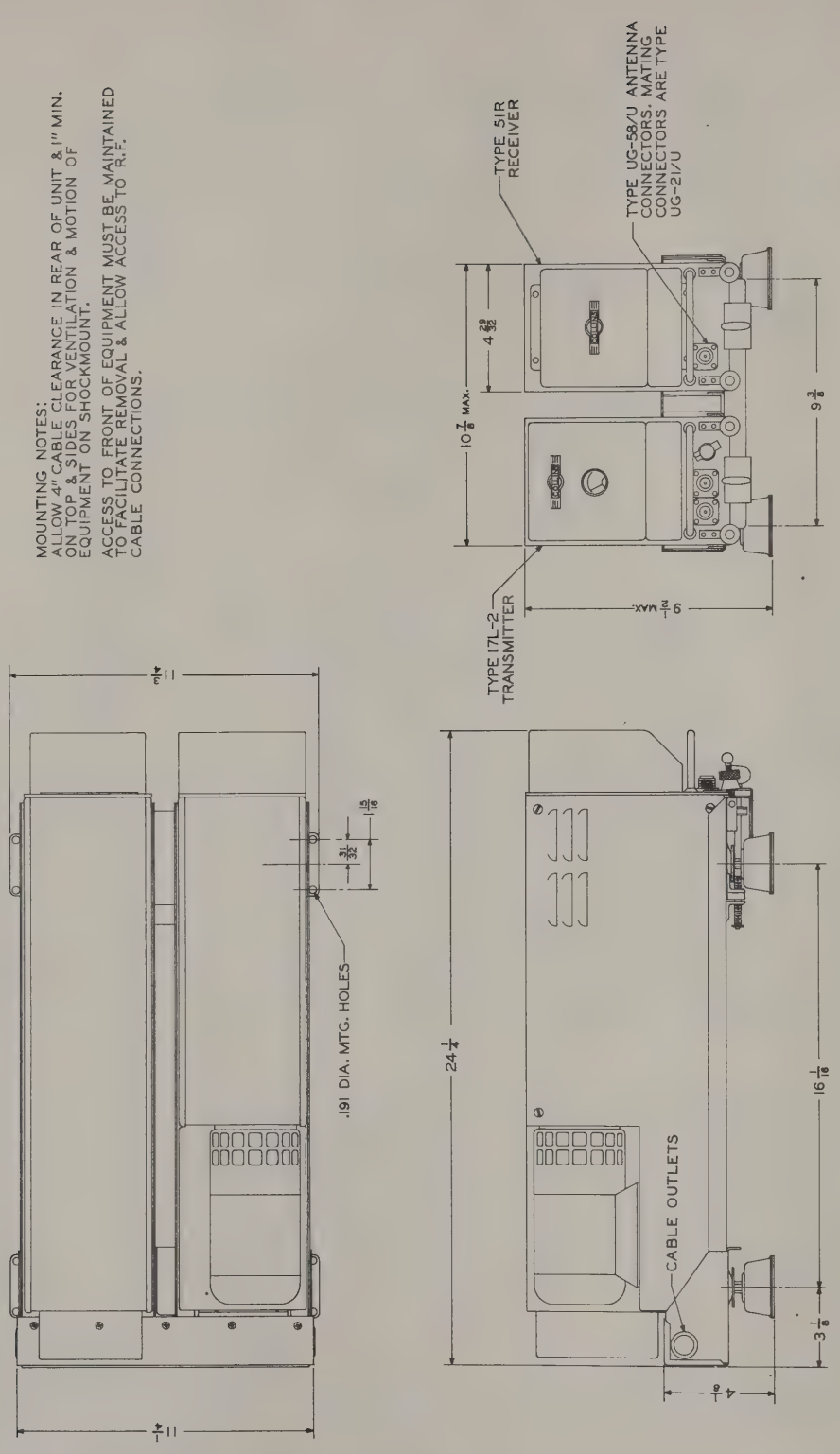

MOUNTING NOTES:
ALLOW 4" CABLE CLEARANCE IN REAR OF UNIT & 1" MIN. ON TOP & SIDES FOR VENTILATION & MOTION OF EQUIPMENT ON SHOCKMOUNT.
ACCESS TO FRONT OF EQUIPMENT MUST BE MAINTAINED TO FACILITATE REMOVAL & ALLOW ACCESS TO R.F. CABLE CONNECTIONS.
TYPE 51R RECEIVER
TYPE UG-58/U ANTENNA CONNECTORS. MATING CONNECTORS ARE TYPE UG-21/U
TYPE 17L-2 TRANSMITTER
.191 DIA. MTG. HOLES
CABLE OUTLETS

Figure 2-2 Installation Drawing - Type 17L-3 Transmitter and Receiver with Dual-Unit Shockmount

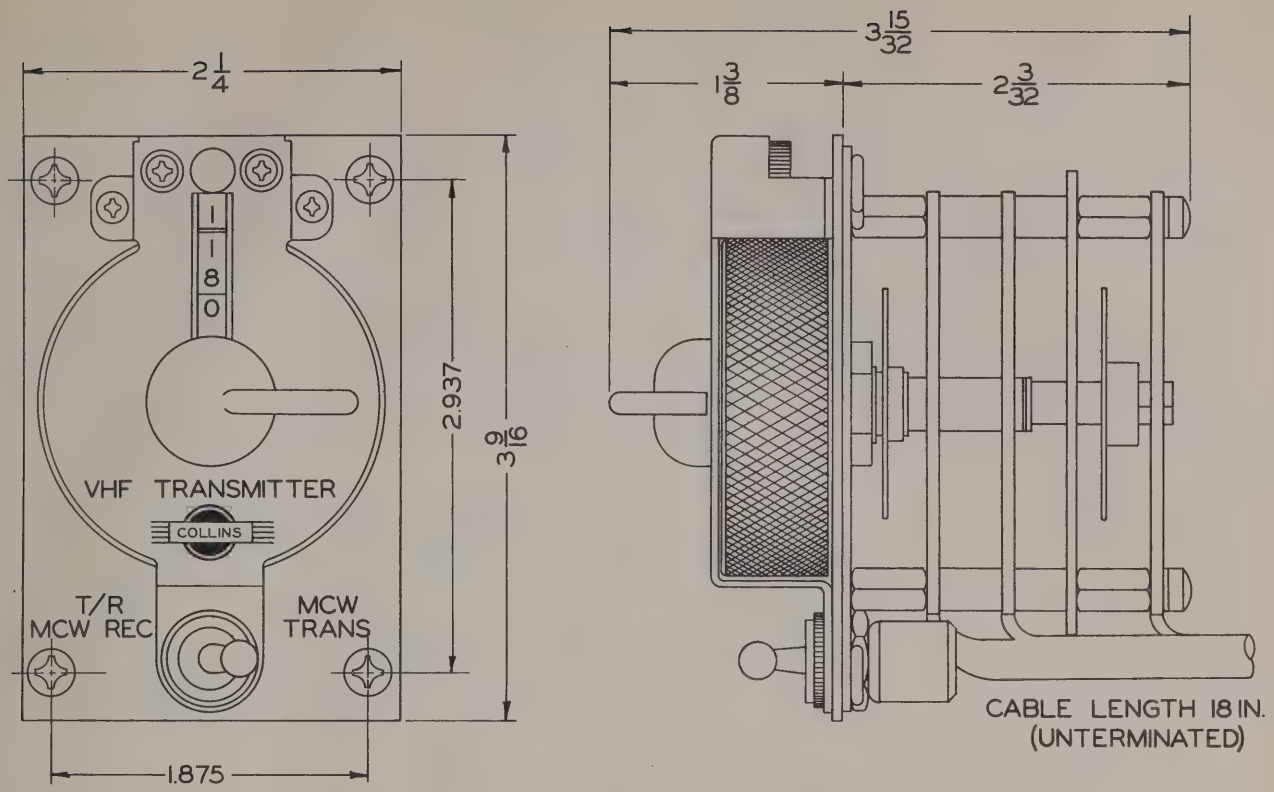


Figure 2-3 Outline Dimensional Drawing - Type 314Y-1
Frequency Control Unit

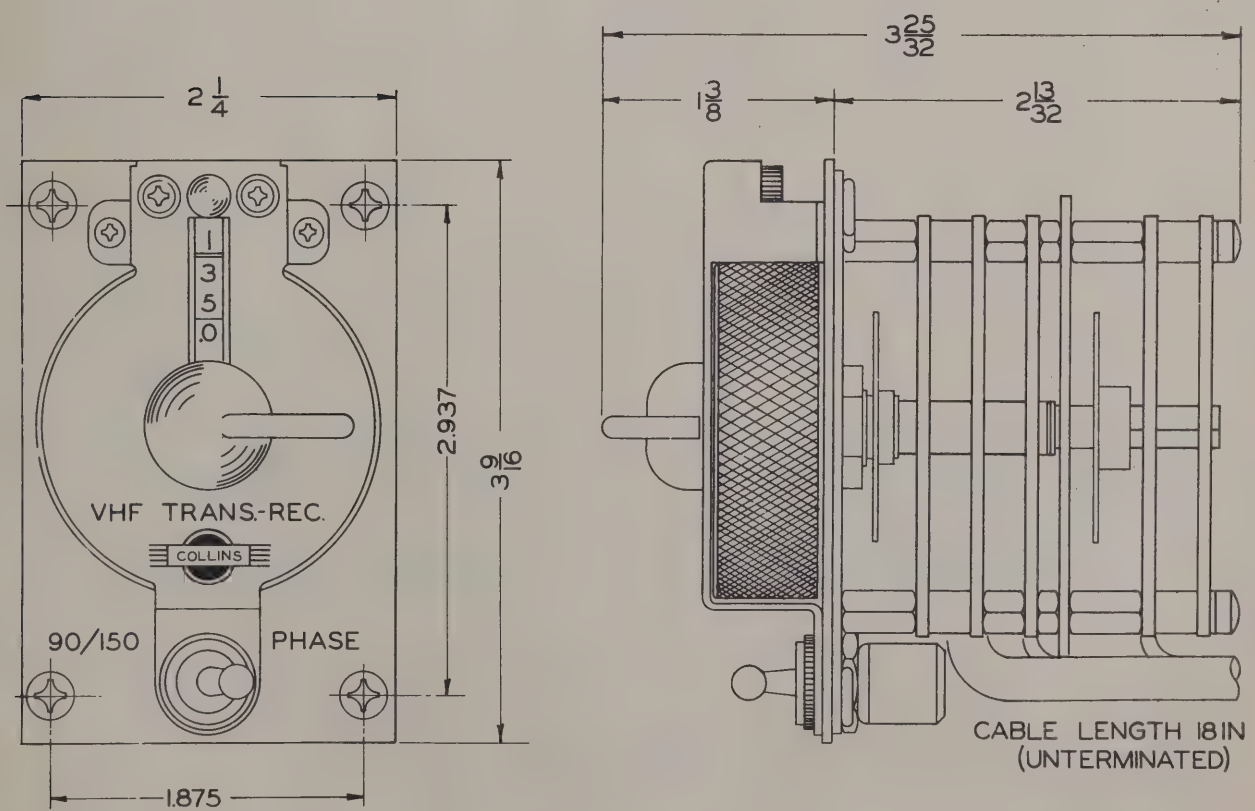


Figure 2-4 Outline Dimensional Drawing - Type 314U-4
Frequency Control Unit

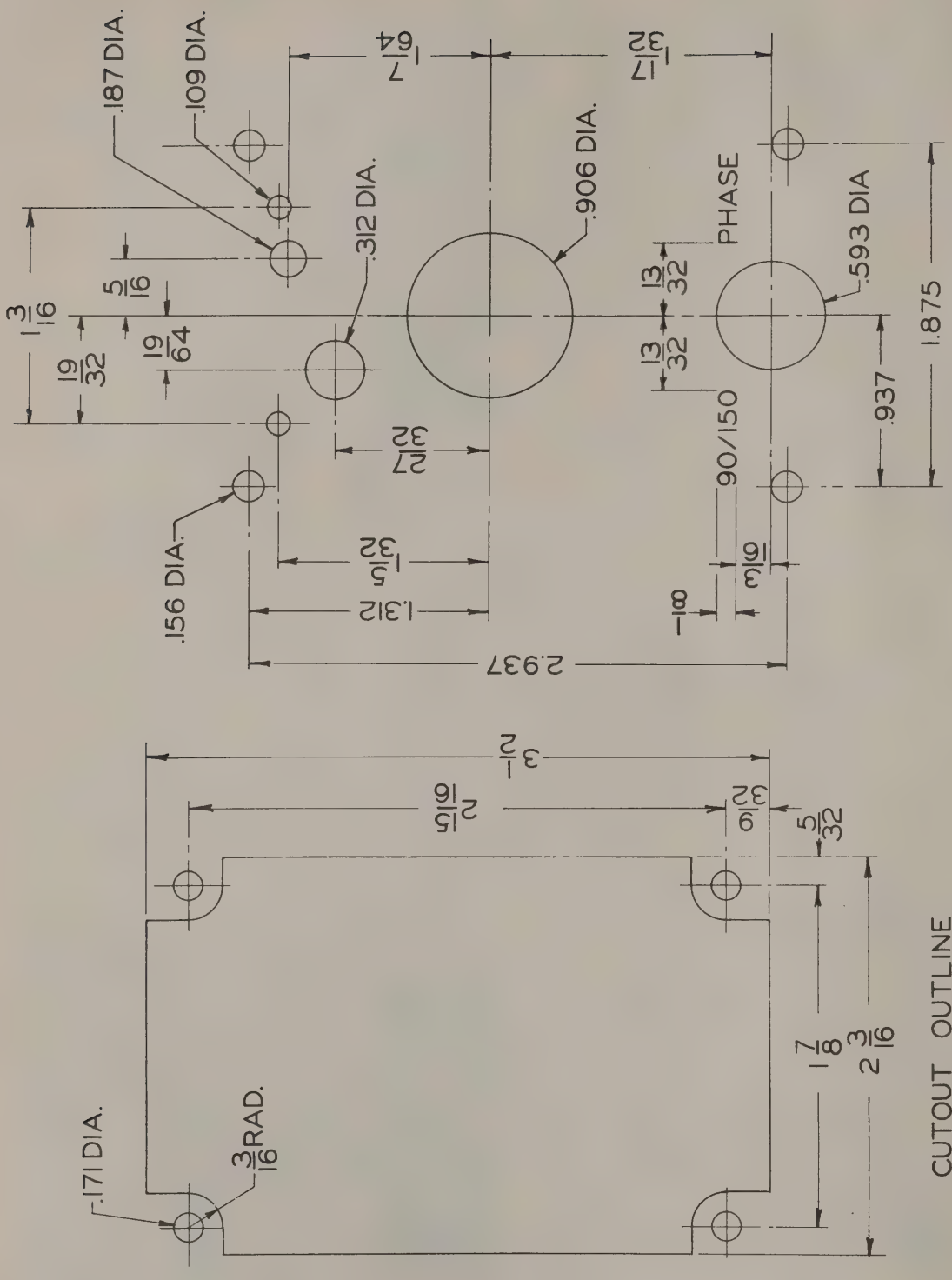


Figure 2-5 Panel Layout Diagrams - Frequency Control Units

5. CONNECTIONS TO 17L-3 TRANSMITTER.

The functions of the connections to the transmitter are listed in Table 1. Note that some connections are for optional operational features and may not be used in all installations. Refer to figure 2-9.

5.a. Primary Power Connections - Connect pins A1 and A2 to the primary 27.5 volt aircraft power supply using No. 14 AWG or larger wire. The use of a 20-ampere circuit breaker is recommended. Voltage drop from the aircraft power bus to the 17L-3 dynamotor terminals should not exceed .75 volt when transmitting.

5.b. Dynamotor Control Connections - When a 51R Receiver is included as part of the installation and the 17L-3 Transmitter is to supply the power for this receiver, the coil of the dynamotor start relay K-3 must be wired so that the dynamotor will operate continuously. This can be done by connecting Pin No. 17 in the shockmount to the ground. If it is desired to operate the dynamotor from the push-to-talk circuit, connect pins No. 17 and 23 together in the shockmount.

5.c. Frequency Control Connections - Connect frequency control wires K, L, M, N, O, P, Q, R and S from pins 3 through 11, respectively, to leads 1 through 9, respectively, on the 314U-4 Control Unit. Schematic diagrams of the control units are shown in figures 2-7 and 2-8.

5.d. Connections When Using 51R Receiver - For a system installation using the 51R Receiver where it is necessary to operate the receiver on frequencies below 118.0 mc, a disabling relay must be added to the 17L-3 Transmitter. This disabling relay will be supplied on special order. To operate the disabling relay, connect pin No. 2 on the transmitter to lead No. 20 on the 314U-4 Control Unit.

5.e. Audio Connections - The audio output of the transmitter sidetone appears at pins No. 18 and 19. Connect these pins to the aircraft interphone system or directly to the headphone jacks. Connect the audio output of the receiver to pins 20 and 21 on the transmitter. Unshielded wire may be used for making audio connections if the wires are only a few feet long. For long runs the use of shielded wire is recommended.

5.f. Microphone Connections - Connect the microphone to pins 22 and 23. Pin 22 must be connected to the microphone button (ring) and pin 23 must be connected to the push-to-talk contact of the microphone. As supplied from the factory, the grid of V-11B is connected to the junction of resistors R-67 and R-68. Thus connected, an input of 0.5 volt will produce 75% modulation. Change connection to voltage divider as required to properly modulate carrier with microphone being used.

TABLE 1

POWER AND CONTROL CONNECTIONS

17L-3 Connector P-1 Pin No.	Connect To	Function
A1	-27.5 V DC (ground)	Primary power
A2	+27.5 V DC	Primary power
1	Receiver	250 V DC for receiver
2	314U-4	Transmitter disabling relay when using 51R Receiver on frequencies below 118.0 mc
3	Control Wire K	Frequency selection
4	Control Wire L	Frequency selection
5	Control Wire M	Frequency selection
6	Control Wire N	Frequency selection
7	Control Wire O	Frequency selection
8	Control Wire P	Frequency selection
9	Control Wire Q	Frequency selection
10	Control Wire R	Frequency selection
11	Control Wire S	Frequency selection
17	(1) Ground for continuous operation of dynamotor	Controls primary power to dynamotor
	(2) Microphone push-to-talk switch for operation of dynamotor only during transmission	
18	Interphone or to headphones	Audio circuit through Power and Audio Transfer Relay K-4
19	Interphone or to headphones	Common connection of transmitter sidetone and receiver audio
20	Receiver audio	Couple receiver audio output to interphone through Power and Audio Transfer Relay
21	Receiver audio	Couple receiver audio output to interphone - parallel with Pin 19
22	Microphone	Audio input to transmitter first audio stage
23	Microphone push-to-talk switch	Circuit through push-to-talk switch controls Power and Audio Transfer Relay and Antenna Transfer Relay

6. CONNECTIONS TO CONTROL UNITS.

6.a. 314Y-1 Control Unit - Refer to figure 2-7.

(1) Connect leads 1 through 9 to pins No. 3 through 11 on the 17L-3 Transmitter. Leads 1 through 9 are the frequency control wires.

(2) Connect lead 10 to ground.

(3) Connect lead 12 to the aircraft's 3.0 volt panel lamp supply.

6.b. 314U-4 Frequency Control Unit - Refer to figure 2-8.

(1) Connect leads 1, 2, 3, 4, 5, 6, 7, 8 and 10 to pins 26 through 34 on the 51R Receiver. These leads are the frequency control leads for the 51R Receiver.

(2) Connect lead 9 to ground.

(3) Connect leads 11 through 19 to pins 3 through 11 on the 17L-3 Transmitter. Leads 11 through 19 are the frequency control leads.

(4) Connect lead 39 to the 3.0 bolt aircraft panel lamp supply.

(5) If an interlock or disabling relay is used in conjunction with the transmitter, connect lead 20 to transmitter pin 2.

7. CONNECTIONS TO 68U RELAY.

Refer to figure 2-9 for connections.

8. ADJUSTMENTS.

8.a. Sidetone Level Control - This is the only control requiring adjustment at the time of installation. A potentiometer with a slotted shaft for screw driver adjustment is located on the front panel beneath the panel cover. Remove the front cover and adjust the control until the audio level from the sidetone is satisfactory for monitoring purposes. Replace the cover.

9. PERFORMANCE TESTS.

When the installation has been completed, a thorough check of all operational functions should be made. The following tests are recommended.

9.a. Frequency Control System

(1) Remove front cover from transmitter.

(2) Select channels and observe readings on indicator dials on Autopositioner units when tuning cycle has been completed.

(3) Continue to select frequencies, checking operation of system on each megacycle and 10th megacycle step.

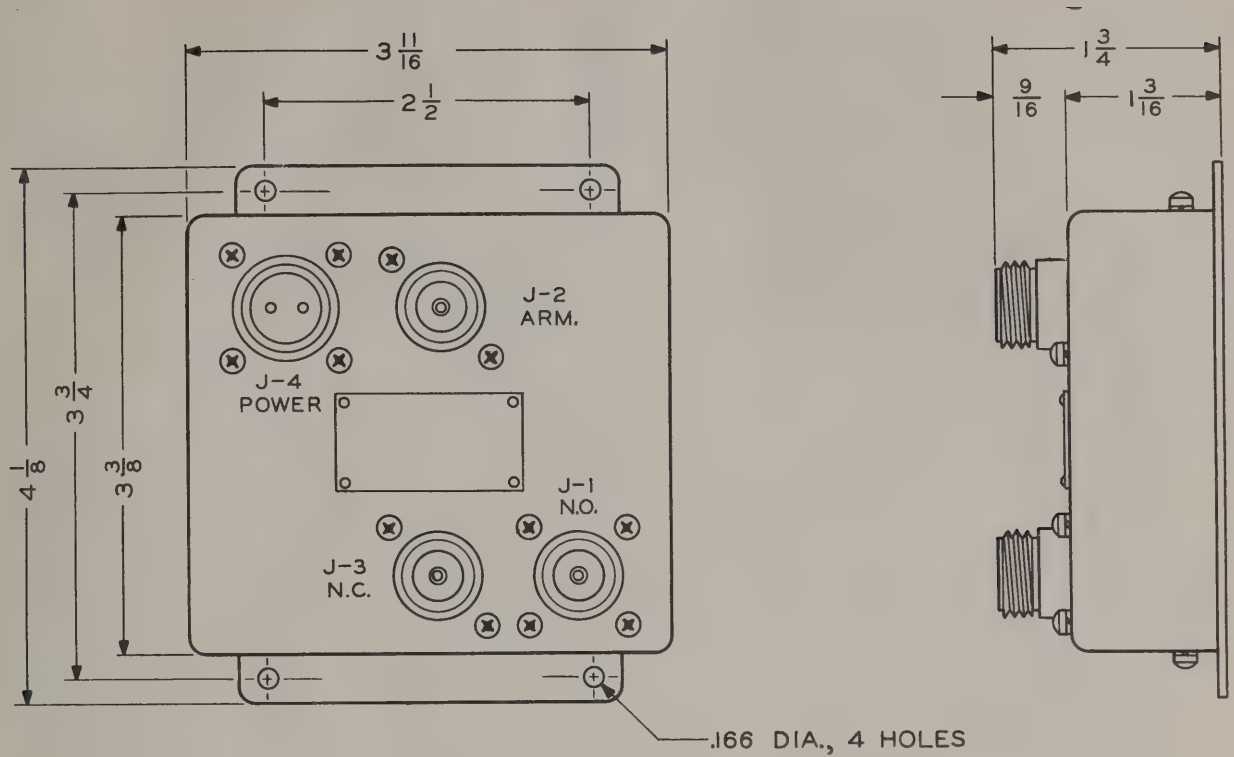
9.b. Power Output - If a phantom antenna is not available and the power is checked by operating into a radiating antenna, only frequencies authorized by license should be used.

(1) If a phantom antenna such as TS-78/U or TS-79/U (used with AN/ARC-1 and AN/ARC-3) is available, connect it to the ANT. Connector and measure the power output of the transmitter. Check power output on all megacycle and 10th megacycle steps.

(2) If a phantom antenna is not available, the power output can be roughly checked by observing the panel meter reading with the meter switch set to ANT, with the output coupled to the antenna. Meter readings of "4" or more should be obtained.

9.c. Modulation - Modulation is best checked by actually communicating with a ground radio or listening to the transmitter output on a receiver. The presence of a satisfactory sidetone signal also indicates proper operation of the modulator.

9.d. Control Circuits - Check operation of all special control circuits that are used in the installation. If the transmitter transfer relay is used to switch the receiver audio output, operation of the receiver should be checked.



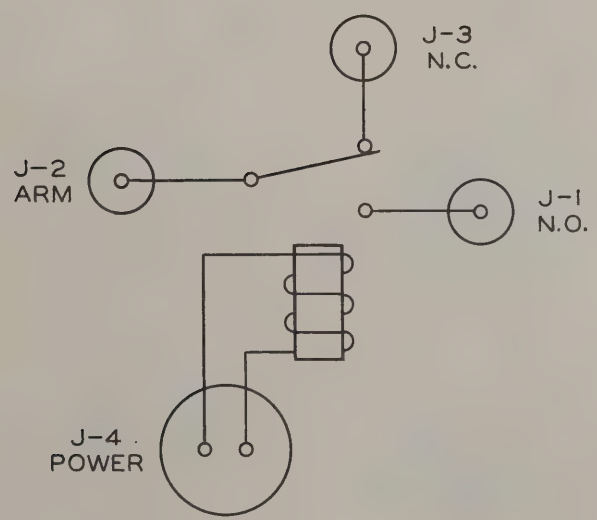
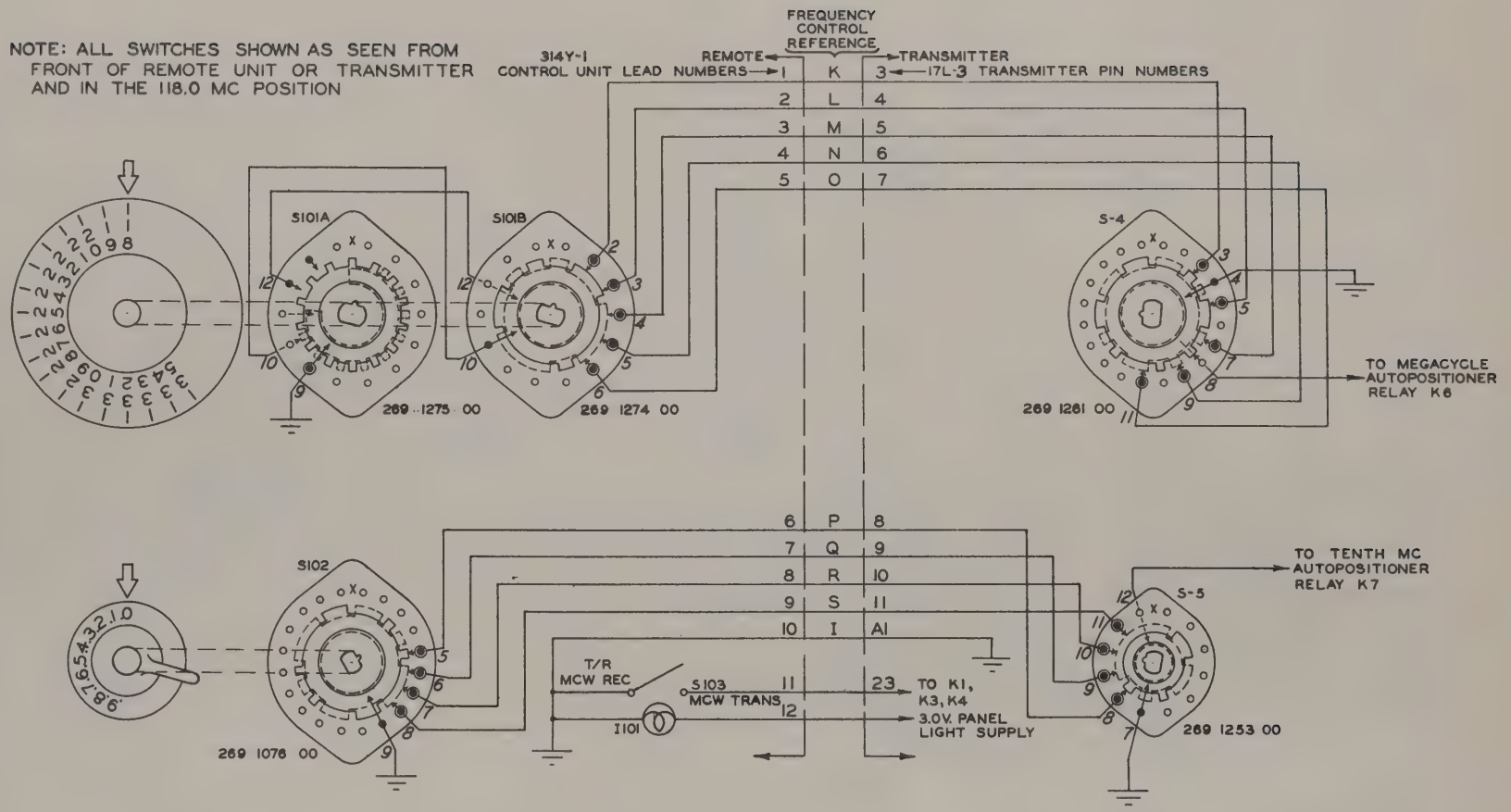


Figure 2-6 Installation and Circuit Diagrams - Type 68U-1 Relay



	MEGACYCLES																	
WIRE	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
K	⏚	●	⏚	⏚	⏚	●	⏚	⏚	⏚	●	⏚	⏚	●	⏚	⏚	⏚	●	⏚
L	⏚	●	⏚	●	⏚	⏚	⏚	●	⏚	⏚	⏚	●	⏚	⏚	●	⏚	⏚	⏚
M	●	⏚	⏚	●	⏚	⏚	●	⏚	⏚	⏚	●	⏚	⏚	●	⏚	⏚	⏚	⏚
N	⏚	⏚	●	⏚	⏚	●	⏚	⏚	●	⏚	⏚	⏚	●	⏚	⏚	●	⏚	⏚
O	●	⏚	●	⏚	●	⏚	⏚	●	⏚	⏚	⏚	●	⏚	⏚	●	⏚	⏚	●

	MEGACYCLES									
WIRE	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
P	⏚	●	⏚	●	⏚	⏚	●	⏚	●	●
Q	●	⏚	●	⏚	●	●	⏚	⏚	●	●
R	●	●	⏚	●	⏚	●	⏚	⏚	⏚	●
S	●	●	●	⏚	●	⏚	●	●	⏚	⏚

KEY
- ●→ CLIP ON FRONT
- ○→ CLIP ON REAR
- ◉→ CLIPS FRONT & REAR (COMMON CONNECTION)

Figure 2-7 Schematic Circuit Diagram - Type 314Y-1 Frequency Control Unit

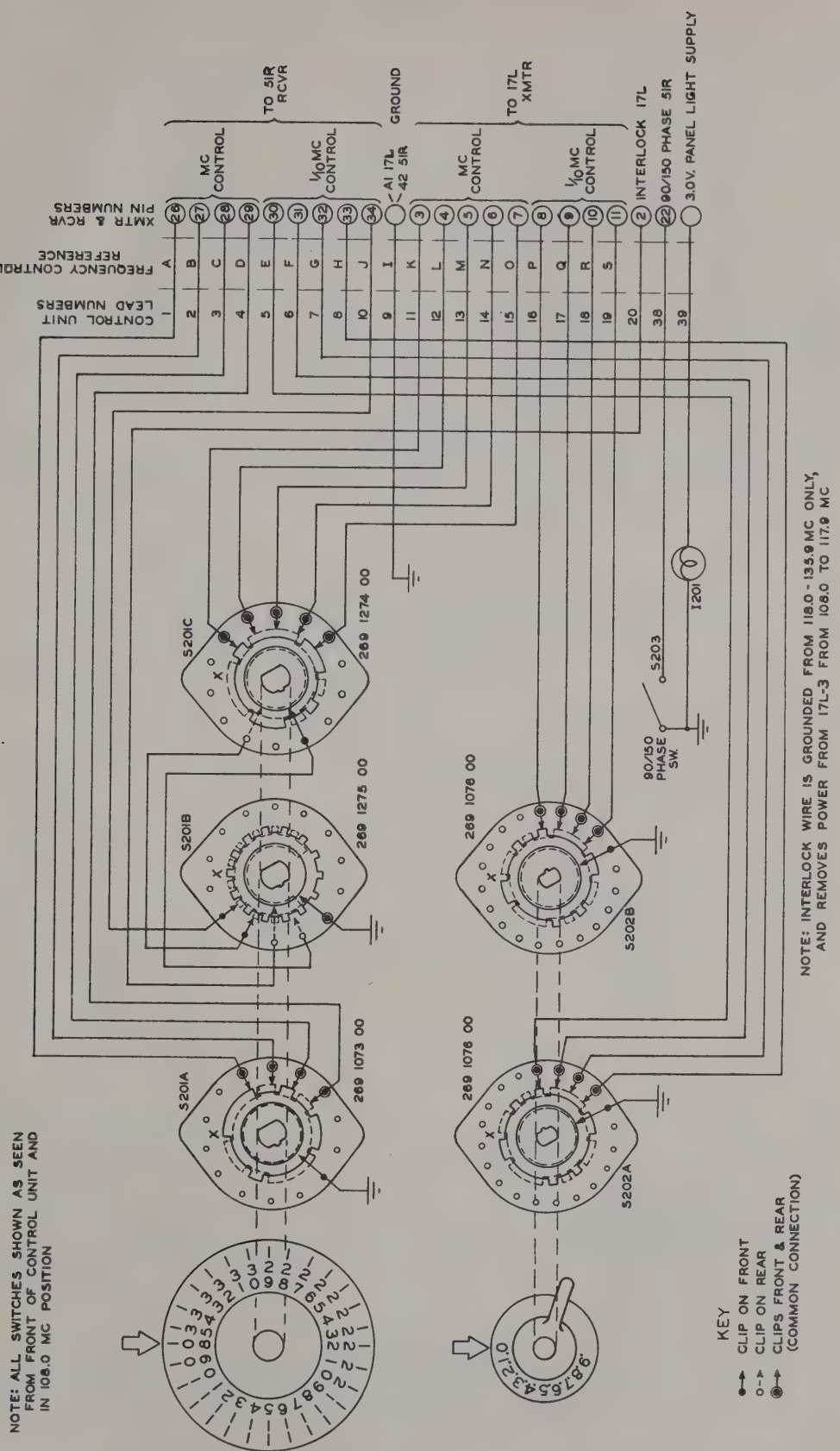
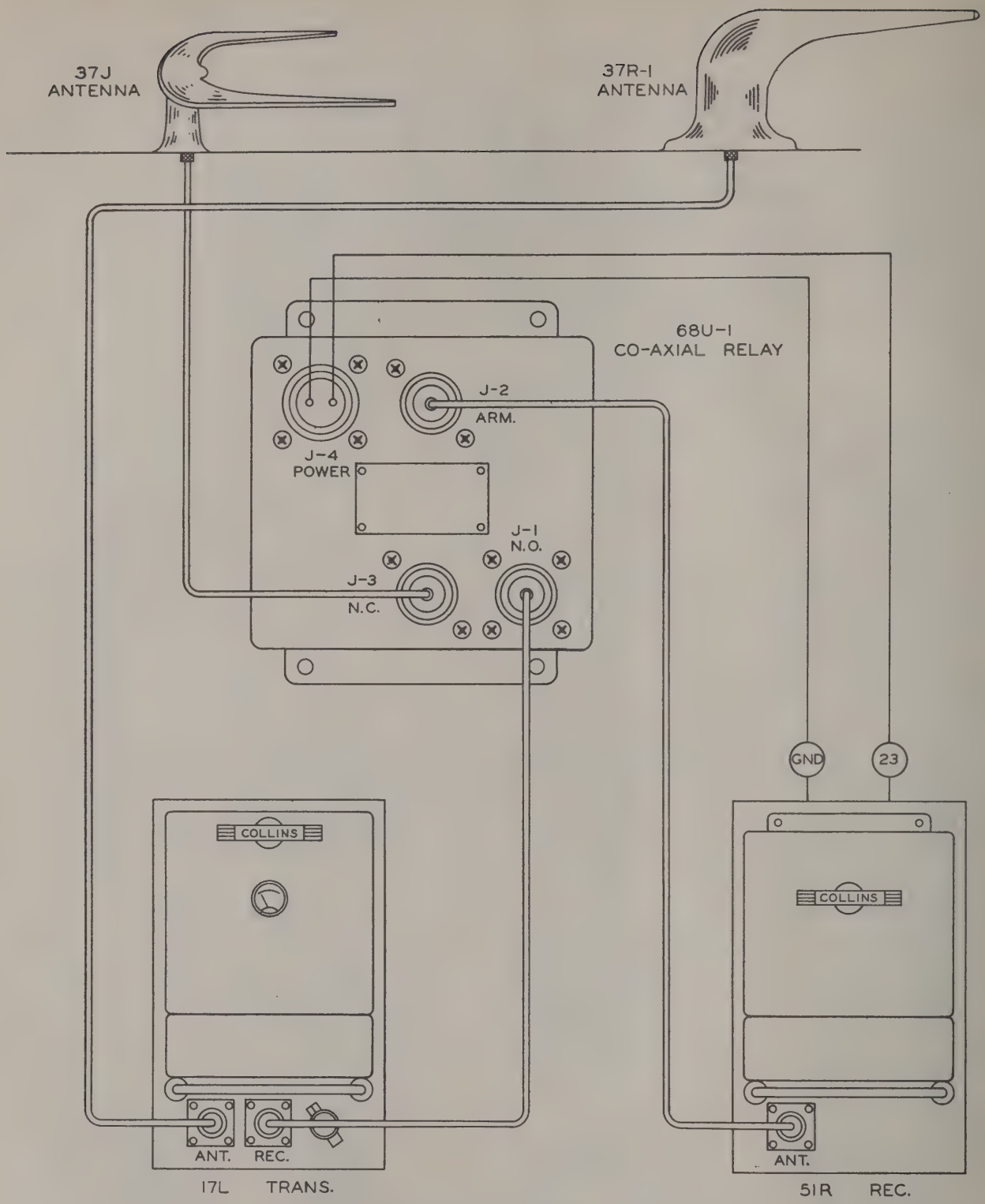


Figure 2-8 Schematic Circuit Diagram - Type 314U-4 Frequency Control Unit



NOTE:
PIN 23 OF THE 51R
SHOCKMOUNT RECEPTACLE
RECEIVES 28V. D.C. AT
FREQUENCIES ABOVE 122.0 MC.

UNITS SHOWN NOT TO SCALE.

Figure 2-9 Interconnection Diagram - Type 68U-1 Coaxial Relay

SECTION III

OPERATION

1. GENERAL.

The 17L-3 VHF Transmitter is an airborne transmitter designed to provide amplitude-modulated voice communication transmission from aircraft to ground or other aircraft. Up to 180 channels covering every one-tenth megacycle from 118.0 mc to 135.9 mc are provided. Transmission of signals in this frequency range is normally limited to line-of-sight distance which is dependent upon the height of the transmitting and receiving antennas. Average communicating distances from aircraft to ground stations are approximately 30 miles at 1000 feet, and 135 miles at 10,000 feet altitude.

2. OPERATING CONTROLS.

2.a. Frequency Selector - The setting of the dial on the Frequency Selector Unit (Type 314Y-1 or Type 314U-4) determines the transmitting frequency. The dials associated with the two knobs combine to read frequency directly in megacycles and tenths of a megacycle.

2.b. Microphone Push-to-Talk Switch - The microphone push-to-talk switch controls the application of power to the transmitter. When the push-to-talk button is pressed, the dynamotor starts and relays transfer the antenna connection from the receiver to the transmitter and the audio output connection (interphone) from the output of the receiver to the output of the sidetone monitoring circuit of the transmitter. If the transmitter is used to supply power to a receiver the dynamotor runs continuously. In this case pressing the microphone push-to-talk button transfers the output voltage of the dynamotor from the receiver to the transmitter and changes the audio connections as indicated above.

3. OPERATING PROCEDURE.

3.a. Voice Communication.

(1) Apply primary power by means of the aircraft's master radio switch and allow about one minute for the transmitter to warm up.

(2) Set frequency selector to frequency upon which it is desired to transmit. Allow about three seconds after setting frequency selector to permit transmitter selector mechanism to operate.

(3) To transmit, press the microphone push-to-talk button and talk into the microphone. Speak with a loud clear voice, holding the microphone at the distance from the lips recommended for the type of microphone being used.

NOTE

AVOID ANY TENDENCY TO TALK INTO THE MICROPHONE BEFORE THE PUSH-TO-TALK BUTTON IS FULLY DEPRESSED. IT IS BEST TO PAUSE MOMENTARILY AFTER DEPRESSING THE BUTTON TO PERMIT THE TRANSMITTER DYNAMOTOR TO COME UP TO FULL SPEED AND TO PERMIT THE SQUELCH CIRCUITS OF THE GROUND STATION RECEIVERS TO OPEN. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN THE MISSING OF THE FIRST WORD OF A TRANSMISSION.

(4) At the end of the transmission release the push-to-talk button. This restores the transmitter and receiver to the receiving condition.

3.b. Monitoring Signal - The 17L-3 Transmitter provides a sidetone monitoring signal. The sound of the sidetone provides a check on the operation of the transmitter. The level of the sidetone output is governed by the SIDETONE LEVEL control (screwdriver set) which is located under the front cover of the transmitter. This control is normally set for proper sidetone output when the installation is made.

4. METER READING.

With the meter switch in the ANT. position, the meter should read "4" or more with the microphone push-to-talk switch held down. A reading of "3" or less will indicate a need for a maintenance check.

SECTION IV

THEORY OF OPERATION

1. GENERAL THEORY.

1.a. The Collins 17L-3 VHF Transmitter will transmit amplitude-modulated radio-telephone signals on any of 180 channels in the frequency range 118.0 to 135.9 mc with a power output of eight watts. The block diagram, figure 4-1, presents a broad picture of the operation of the various electrical and mechanical elements of the transmitter. A complete schematic circuit diagram is shown in figure 7-1.

1.b. This transmitter employs two banks of crystals and a frequency multiplication and addition system to produce up to 180 signal frequencies which are spaced at 100 kc intervals from 118.0 to 135.9 mc. Refer to the functional diagram, figure 4-1. One crystal in the bank of 18 crystals operates in conjunction with the megacycle-determining oscillator-frequency multiplier section, consisting of V-1, V-2, V-4 and V-5, to produce a signal at a frequency in the range of 90 to 107 megacycles. A crystal in the bank of 10 crystals operates with the tenth-megacycle oscillator-frequency multiplier, V-3, to produce a signal at a frequency in the range of 28.0 to 28.9 mc.

1.c. The signals thus generated by the two oscillator-frequency multiplier sections are combined in a balanced mixer circuit, V-6 and V-7, to produce the output frequency, which is the sum of the two input frequencies. The output of the balanced mixer circuit is then amplified by a push-pull driver amplifier, V-8 and V-9, and the push-pull power output amplifier, V-10.

1.d. The power amplifier, V-10, is plate and screen modulated. The audio section consists of audio amplifier V-11B, 1/2 of a dual triode and a push-pull modulator V-12 and V-13. The carbon microphone is transformer coupled to the input of the first audio stage. It is possible to adjust the level of the audio input by changing the grid connection to a series of resistors, R67, R68 and R69, that are connected across the secondary of coupling transformer T-1. This connection is ordinarily made to the junction of R67 and R68 to produce 75% modulation with approximately 0.5 volt input, but may be changed, depending upon the type of microphone that is to be used. A sidetone detector-amplifier consisting of CR-1 and V-11A provides an audio signal for monitoring purposes. A portion of the output of the transmitter is rectified by CR-1 and fed to the grid of V-11A. The output of the sidetone amplifier is transformer coupled to the monitoring circuits and during transmission is coupled to the interphone by relay K-4.

1.e. Selection of the frequency-determining crystal units is performed by remotely controlled motor-driven Autopositioner units. The Autopositioner unit that selects the megacycle-determining crystal also operates the mechanism

which tunes the circuits associated with the frequency multiplier, mixer, driver-amplifier and power amplifier. The tuned circuits of the tenth-megacycle determining oscillator-multiplier are broad-band fixed-tuned circuits.

1.f. High-voltage for the operation of the transmitter is supplied by a built-in dynamotor power supply, D-1. This power supply can also be used to operate a Collins 51R Receiver for communications purposes. Relays in the 17L-3 Transmitter provide automatic transfer of antenna, power and audio output connections from receiver to transmitter.

2. DETAILED ELECTRICAL AND MECHANICAL THEORY.

2.a. Megacycle-Determining Oscillator-Frequency Multiplier

(1) The megacycle-determining oscillator-frequency multiplier section includes crystal oscillator-first multiplier, V-1(5654/6AK5), second multiplier, V-2(5654/6AK5), and push-pull amplifier V-4 and V-5(5654/6AK5). The crystal oscillator circuit employs 18 crystals, Y-1 through Y-18, mounted on a crystal holder board with crystal selector switch S-1. The oscillator circuit is a modified Colpitts circuit in which a tuned circuit at crystal frequency is not required. In this circuit, the crystal presents an inductive impedance which resonates with capacitors C-1, C-2 and C-30 (plus wiring and tube capacitances). The screen of V-1 acts as the plate of the oscillator and, in this application, is by-passed to ground by C-3. Tube V-1 also operates as an electron-coupled frequency multiplier, the tuned circuit L-2, C-5, and C-6 being tuned to four times the crystal frequency by means of a powdered iron slug which varies the inductance of L-2.

(2) The output circuit of V-1 is inductively coupled to tuned circuit L-3, C-7 and C-8, which in turn is coupled to the grid of the second multiplier tube, V-2 by C-9. Tube V-2 operates as a frequency tripler, its output circuit, L-4, C-13 and C-14, being tuned to 12 times the crystal oscillator frequency. The output of the second multiplier stage is amplified in push-pull amplifier V-4 and V-5. The output circuit of this stage, L-9, C-27 and C-29, is coupled by L-10 and a short length of coaxial transmission line to the input circuit of the balanced mixer section.

(3) Through the use of 18 crystal units, Y-1 through Y-18, the frequencies of which are multiplied 12 times, the frequency of the output signal of the megacycle-determining oscillator-multiplier section can be set to any integral megacycle from 90.0 mc to 107.0 mc inclusive. The settings of the crystal-selecting switch S-1 and the powdered iron slugs which determine the resonant frequencies of the various tuned circuits are controlled by the megacycle-determining Autopositioner unit which in turn is controlled by the megacycle-selecting switch of the frequency-selecting unit.

2.b. Tenth-Megacycle Determining Oscillator-Frequency Multiplier

(1) The tenth-megacycle determining oscillator-frequency multiplier section uses V-3(5654/6AK5) in conjunction with a group of 10 crystals, Y-19 through

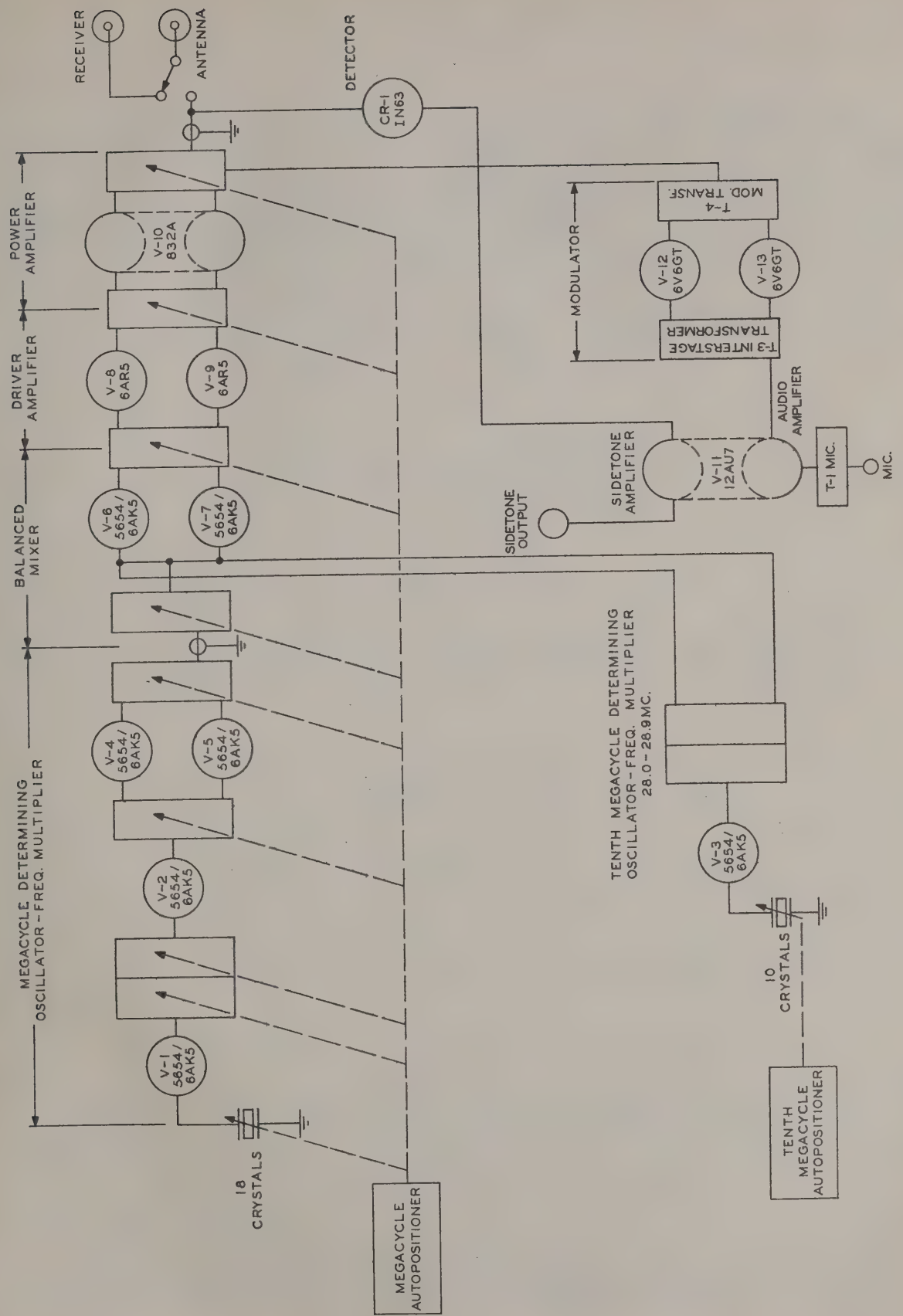


Figure 4-1 Functional Diagram - Type 17L-3 VHF Transmitter

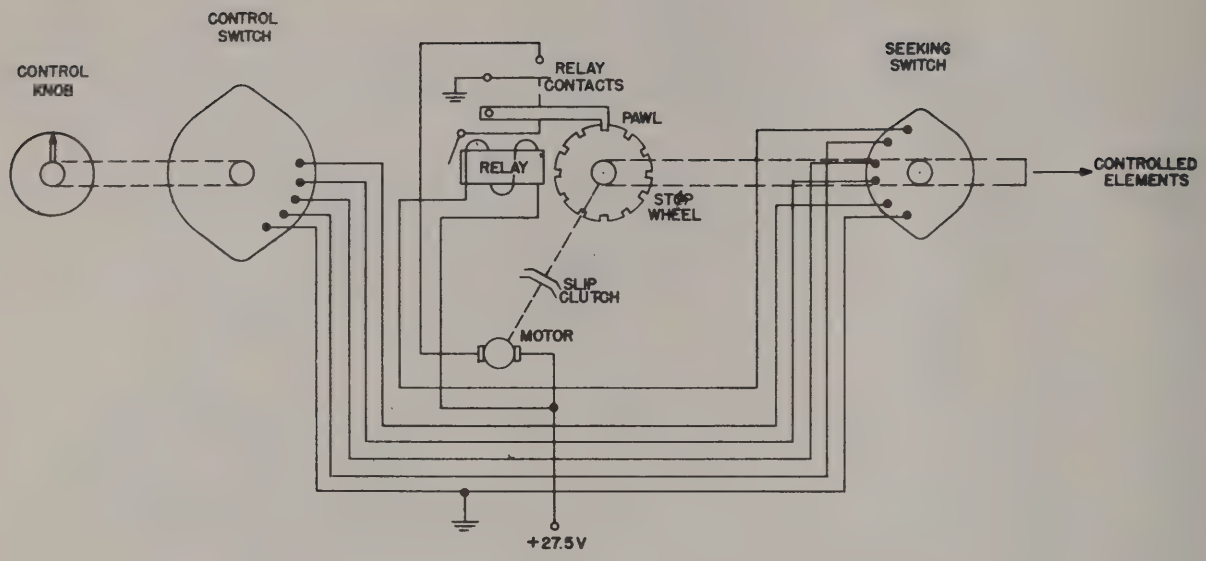


Figure 4-2 Functional Diagram - Autopositioner System

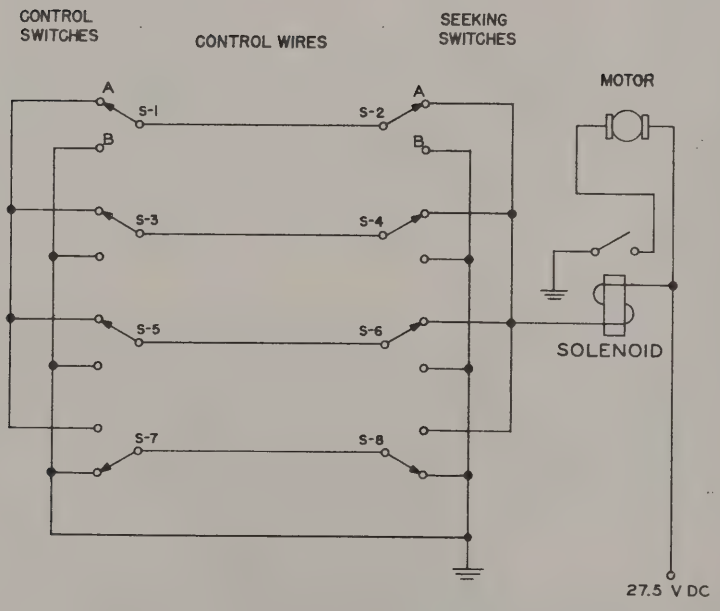


Figure 4-3. Basic Diagram - Simplified Control System

Y-28, and a double-tuned coupling transformer, Z-1. The crystals mount on a crystal holder board with the crystal selector switch S-2. The oscillator-frequency multiplier circuit is identical to that of V-1 except that the output circuits are fixed-tuned broad-band circuits operating at three times crystal frequency. The output signal is coupled to the input circuit of the balanced mixer through isolating chokes L-6 and L-7. The frequency of the output signal from this section can be set to any integral tenth megacycle from 28.0 through 28.9 mc, inclusive. The setting of the crystal selector switch S-2 is controlled by the tenth-megacycle determining Autopositioner unit which is in turn controlled by the tenth-megacycle selecting switch on the frequency control unit.

2.c. Balanced Mixer

(1) The balanced mixer section utilizes V-6 and V-7(5654/6AK5) operating in a circuit which combines the signals from the megacycle-determining oscillator-frequency multiplier section and the tenth-megacycle determining oscillator-frequency multiplier to produce a signal of a frequency equal to the sum of the frequencies of the two input signals. This circuit is similar to the balanced modulator circuits used in carrier telephone systems. The 90.0 to 107.0 mc signal is applied to the grids of V-6 and V-7 in parallel through coupling capacitors C-32 and C-33. Tuned circuit L-12, C-31 is tuned to the 90.0 to 107.0 mc frequency, and receives its signals through coupling link L-11. The 28.0 to 28.9 mc signal is applied to the grids in push-pull fashion through isolating-chokes L-6 and L-7.

(2) The plates of the balanced mixer tubes are connected in push-pull to tuned circuit L-14, C-39 which operates at the output frequency of the transmitter. The frequency of the output is the sum of the two frequencies applied to the input of the balanced mixer. This type of mixer circuit reduces the amount of direct transmission of the 90.0 to 107.0 mc signal through the circuit. This signal is applied to the grids of the two tubes in parallel whereas the plates of the tubes are connected in push-pull. A balancing action takes place which tends to suppress the 90.0 to 107.0 mc signal. The input and output tuned circuits of the balanced mixer are tuned by silver-plated copper slugs whose positions are controlled by the megacycle-determining Autopositioner unit.

2.d. Driver Amplifier

(1) The output of the balanced mixer is capacitively coupled to the grids of the push-pull driver amplifier, V-8 and V-9(6AR5), by C-40 and C-41. This stage operates as a conventional Class C amplifier. Its output circuit, L-16, C-47, is tuned by means of a silver-plated copper slug.

2.e. Power Amplifier

(1) The output of the driver-amplifier is coupled to the grids of the power amplifier tube, V-10(832A), a conventional push-pull Class C amplifier.

The 832A tube consists of two beam pentode sections in a single envelope. The screens of the two sections are connected together and bypassed to the common cathode connection by an internal capacitor of approximately 65 mmfd. These internal connections, together with the unique physical configuration of the tube, make it well suited for use in the frequency range covered by the 17L-3 Transmitter.

(2) The output circuit of the amplifier is tuned by means of a silver-plated copper slug which varies the inductance of L-18. Antenna coupling link L-19 couples the output of the power amplifier to the antenna. Inductor L-19 is tuned by adjustable capacitor C-54 to match the transmitter output to a 52 ohm load.

2.f. Audio Amplifier-Modulator

(1) The audio section of the transmitter consists of two stages. The output of the microphone is transformer coupled to the first audio amplifier stage, which utilizes 1/2 of a 12AU-7 dual triode, V-11B. The cathode circuit of this first audio stage is transformer coupled to the grids of the modulator tubes by Transformer T-3. The push-pull modulator utilizes two 6V6 tubes, V-12 and V-13. Microphone current for the carbon microphone is supplied by the 27.5 volt primary power source through resistor R-47 and is filtered by capacitor C-62. The modulator tubes are cathode-biased by parallel connected resistors R-49, R-50 and R-65. The plates of the modulator tubes are connected to the primary of modulation transformer T-4. Plate and screen voltages for the modulator tubes are obtained from the dynamotor. The output of the dynamotor is reduced to approximately 345 volts by resistor R-40. The screen voltage is further dropped by series resistor R-51. The plate and screen voltages for power amplifier V-10 are coupled through the secondary of modulator transformer T-4. The audio signal developed by the modulator is superimposed on the d-c supply to produce amplitude modulation of the output of the power amplifier in accordance with the voice signal applied to the microphone.

2.g. Sidetone Detector-Amplifier

(1) The sidetone detector-amplifier circuit consists of a detector circuit employing a germanium crystal diode, CR-1, and an audio amplifier, V-11A(one section a 12AU7 double triode). The detector circuit is a conventional diode detector circuit which is coupled to the antenna coupling link L-19 by C-55. The audio output of the detector is coupled to the grid of V-11A through capacitor C-58 and SIDETONE LEVEL control R-41. Tube V-11A operates as a cathode-biased Class A amplifier. Audio output appears across the secondary of T-2 and is connected to the interphone circuit during transmission by relay K-4.

2.h. Power Supply

(1) High voltage is supplied to the various circuits of the transmitter by dynamotor D-1. The motor section of D-1 receives power from the 27.5 volt

primary supply. The generator portion produces approximately 350 volts. The negative end of this winding is connected to the positive side of the primary supply, resulting in a voltage of approximately 375 volts. Resistors R-40, R-39 and R-31 reduce this voltage for application to the low power and audio stages. The full output voltage is applied to the power amplifier.

(2) The dynamotor will also supply 250 volts DC at 65 ma for a companion receiver such as the Collins 51R. A voltage divider, consisting of R-61 and R-62, reduces the output voltage to the proper value and capacitors C-68 and C-69 provide filtering.

2.i. Filament Circuits

(1) The filaments of the tubes employed in the 17L-3 Transmitter operate directly from the 27.5 volt primary supply and are connected, together with dropping resistors R-55, R-56, R-57, R-58, R-59 and R-60, in a series-parallel arrangement designed to provide the proper filament voltage for each tube.

NOTE

BECAUSE OF THIS SERIES-PARALLEL ARRANGEMENT, IT IS IMPORTANT THAT PRIMARY POWER NOT BE APPLIED TO THE TRANSMITTER UNLESS ALL TUBES ARE IN PLACE. REMOVAL OF ANY TUBE FROM ITS SOCKET MAY RESULT IN THE APPLICATION OF EXCESSIVE FILAMENT VOLTAGE TO OTHER TUBES IN THE TRANSMITTER.

2.j. Autopositioner System

(1) To provide automatic remote selection of transmitting frequency, the 17L-3 Transmitter is equipped with a Collins Autopositioner system. This system consists of two Autopositioner units driven by a common motor and controlled by a 9-wire simplified control system. The megacycle-determining Autopositioner unit is controlled by the megacycle-selecting switch on the frequency selector unit and operates the crystal selector switch and tuning mechanism associated with the megacycle-determining oscillator-frequency multiplier section, the balanced mixer, driver amplifier, and power amplifier. The tenth-megacycle determining Autopositioner unit is controlled by the tenth-megacycle selecting switch of the frequency selector unit and operates the crystal switch associated with the tenth-megacycle oscillator frequency multiplier section.

(2) The Autopositioner is a motor-driven mechanism which will set a shaft to any one of a number of angular positions by remote control. The basic elements of the Autopositioner, as shown in figure 4-2, consist of a motor and its gear train, a slip clutch, a rotating shaft on which is fastened a notched stop wheel, a pawl which engages the notches in the stop wheel and a relay which actuates the pawl and operates a pair of electrical contacts for starting and stopping the motor. Associated with each Autopositioner unit is an electrical control system consisting of a remotely located control switch actuated by the frequency selector knob and a similar "seeking" switch driven by the

Autopositioner shaft. This control system is designed so that whenever the control switch and the seeking switch are not set to the same electrical position, the Autopositioner unit will operate and drive its shaft to the proper position so that the symmetry of the control system is restored.

(3) Referring to figure 4-2, the cycle of operation of the Autopositioner is as follows:

(a) The system is at rest with the control system in symmetry, relay in its non-operated position, pawl engaging a stop-wheel notch and the motor non-energized.

(b) The operator changes the setting of the frequency selector switch.

(c) The control system causes the relay to operate, lifting the pawl out of the stop-wheel notch and closing the relay contacts.

(d) The motor starts, driving the Autopositioner shaft and the rotor of the seeking switch.

(e) The seeking switch reaches the point of symmetry and the control system opens the relay coil circuit, permitting the pawl to drop into the stop-wheel notch, stopping the rotation of the Autopositioner shaft.

(f) The relay contacts open and the motor coasts to a stop, its rotational energy being dissipated in the slip clutch.

(4) The seeking switch of the control circuit is adjusted so that the relay coil circuit will be opened shortly before the stop-wheel reaches the point where the pawl can drop into the proper notch. The relay contacts which control the motor are mechanically operated by the pawl arm and cannot open until the pawl drops into the stop-wheel notch.

(5) Note that the slip clutch between the motor and the Autopositioner shaft not only absorbs the energy of the motor as it coasts to a stop but also permits the operation of two or more Autopositioner units from a single motor. When this is done, the motor starting contacts of the Autopositioner relays are connected in parallel so that the motor will operate as long as an Autopositioner relay is operated.

(6) To provide a positive method of controlling the Autopositioner units with a minimum number of control wires, a special simplified control system using the control wires in various combinations has been developed. In the 17L-3 Transmitter, five wires plus ground are employed to control the megacycle-determining Autopositioner unit (18 active positions) and four wires plus ground control the tenth-megacycle determining Autopositioner (10 active positions).

(7) This system can best be understood by considering a system of single-pole double-throw switches as shown in figure 4-3. Note that when the switches are set symmetrically (S-1 in the same position as S-2, etc.), there is no current path from the relay coil to ground and the motor will remain unenergized. If, however, any one of the control switches is set to a position different from that of its corresponding seeking switch, a path to ground will be created, causing the motor to operate until the symmetry of the system is restored.

(8) The total number of different combinations in a system such as this is equal to 2^N where N is the number of control wires used. In the case of the four-wire system shown, $2^4 = 16$ different combinations exist. However, one combination is not usable in this application; as can be seen from figure 4-3, if all the seeking switches are set to OFF, there can be no path from coil to ground no matter how the control switches are set. Hence, the maximum number of combinations usable in this system is $2^N - 1$. Thus, a 3-wire system can control 7 positions, 4 wires 15 positions, 5 wires 31 positions, etc.

(9) The system of figure 4-3 could be made physically realizable for the control of a rotating shaft by using leaf-type single-pole double-throw switches actuated by a group of cams mounted on the rotating shaft which would turn the switches on and off in the proper sequence as the shaft is rotated.

(10) To eliminate the bulk and complexity of such a system, special wafer-type rotary switches have been designed to perform the required functions. A drawing of the 12-position 4-wire switch used as the seeking switch of the tenth-megacycle Autopositioner is shown in figure 4-4. This switch is typical of the type used in the simplified control system and employs two rotor sections with their respective contacts and four pairs of stator contacts, each pair of which has a common connection to which a control wire is connected.

(11) As used in the 17L-3 Transmitter, the front rotor section is connected to ground and the rear rotor section is connected to the Autopositioner relay coil. Note that the two rotor sections are the electrical reverse of each other; that is, any control wire contact which is not grounded by the front rotor section is connected by the rear rotor section to the relay coil. As the rotor of the switch is rotated, ten separate combinations of connections are set up as shown by the table of figure 4-4. A similar switch providing 18 combinations of five control wires is used as the seeking switch for the megacycle-determining Autopositioner unit.

(12) As employed in the 17L-3 Transmitter, a single motor, B-1, and its associated train of speed-reduction gears drives the two Autopositioner unit, each of which is equipped with a slip clutch. The megacycle-determining Autopositioner unit is controlled by seeking switch S-4 and relay K-6 and operates a cam-driven slug table which varies the inductance of coils L-2, L-3, L-4, L-9, L-12, L-14, L-16 and L-18. A shaft driven from the main cam

shaft by a pair of spiral gears operates crystal selector switch S-1. Of the 20 positions provided by the Autopositioner, only 18 are actively used, the remaining two being used to provide the cam return necessitated by the fact that the Autopositioner shaft is driven in one direction only.

(13) The tenth-megacycle Autopositioner unit is controlled by seeking switch S-5 relay K-7 and operates crystal selector switch S-2. Of the 12 positions available, only 10 are actively used.

2.k. Relay Circuits

(1) In addition to the relays employed in the Autopositioner system, several other relays are used to provide certain necessary functions.

(2) Antenna transfer relay K-1 is a single-pole double-throw relay which controls the antenna connection and is operated by the microphone push-to-talk switch. Normally antenna connector J-1 is connected to receiver connector J-2. When the push-to-talk switch is operated, the antenna is connected to the transmitter power amplifier output coupling link.

(3) The power and audio transfer relay, K-4, is also operated by the push-to-talk circuit of the microphone. This relay transfers the output of the dynamotor from the receiver to the transmitter, couples the output of the side-tone amplifier to the interphone circuit during transmission and connects the output of the receiver to the interphone circuit during reception.

(4) The dynamotor start relay, K-3, is a single-pole, single-throw, double-break relay connected in the primary circuit of the dynamotor. This relay is also controlled by the push-to-talk circuit except when the transmitter dynamotor is used to energize a receiver. In this case, it is necessary to connect the ground terminal of the relay coil directly to ground to cause the dynamotor to operate continuously.

(5) The function of Autopositioner interlock relay K-2 is to prevent the transmitter from operating during the period of frequency change. The coil of the relay is connected in parallel with the Autopositioner motor B-1 and its contacts are connected in series with the push-to-talk circuit. Thus, so long as the Autopositioner motor is operating, relay K-2 is energized and no signal can be transmitted.

(6) The transmitter interlock relay K-8 (not normally supplied) is employed to disable the transmitter Autopositioner system and push-to-talk circuit by breaking the primary supply to the Autopositioner system and relays K-1, K-3 and K-4. This circuit is used when the 314U-4 Simplex Frequency Control Unit and a 51R Receiver are employed in conjunction with the 17L-3 Transmitter. The 314U-4 Frequency Control Unit can set the 51R Receiver to frequencies as low as 108.0 mc, but since the 17L-3 Transmitter will not operate below 118.0 mc, it is necessary to use the disabling circuit below

118.0 mc to prevent improper operation of the transmitter. To accomplish this, the 314U-4 Control Unit is equipped with a switch section to operate the disabling circuit whenever the frequency is set below 118.0 mc.

2.1. Metering Circuits

(1) To permit the metering of the transmitter circuits for testing and maintenance purposes, the 17L-3 Transmitter is equipped with a metering system consisting of meter M-1 and meter switch S-3 and various resistor networks.

(2) By means of the metering system, the following currents and voltages can be measured:

(a) Primary battery supply voltage

(b) Grid current of balanced mixer section, V-6 and V-7

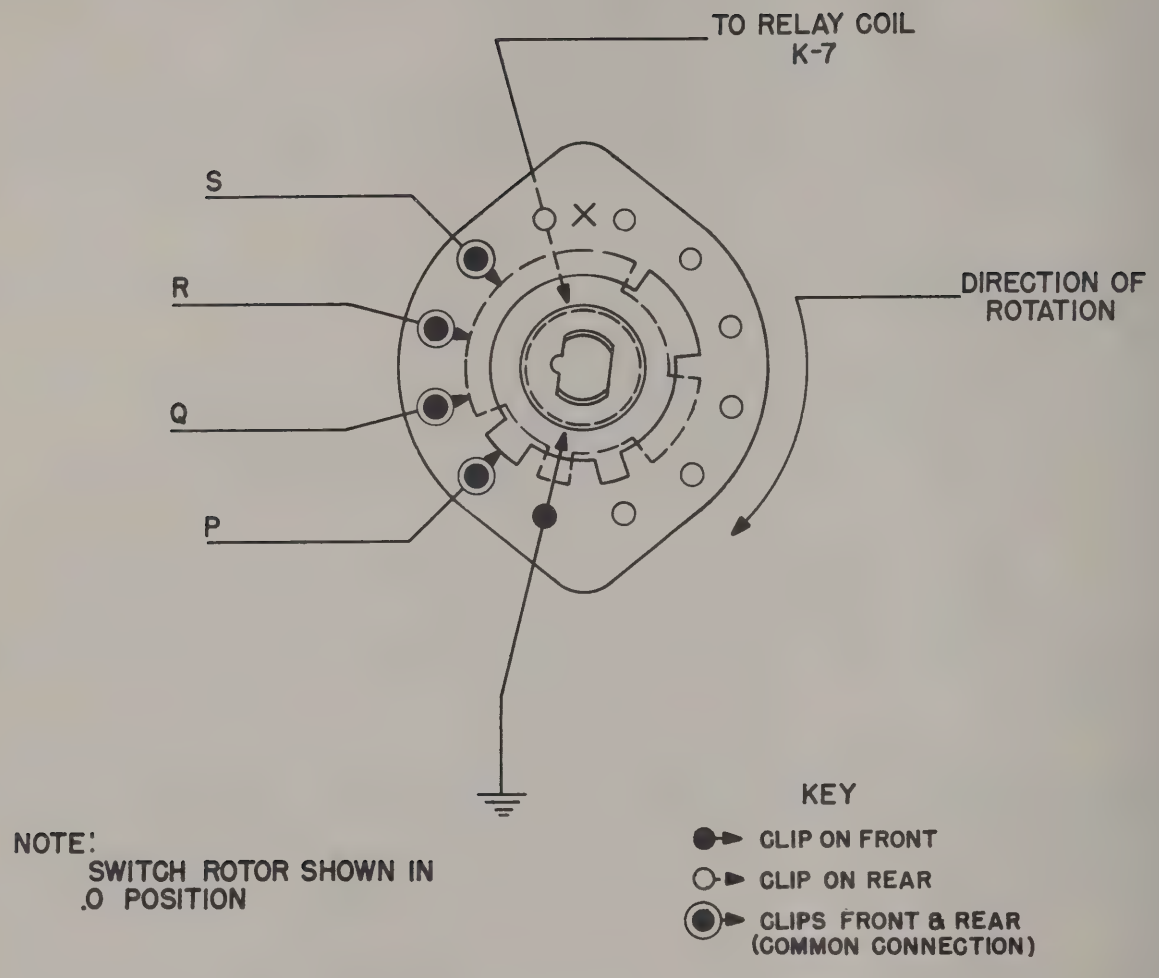
(c) Grid current of driver amplifier, V-8 and V-9

(d) Grid current of power amplifier, V-10

(e) Cathode current of power amplifier, V-10

(f) Transmitter output voltage is indicated by crystal diode detector circuit.

(3) Meter readings indicating proper operation of the transmitter are given in Section V, Maintenance.



	MEGACYCLES									
WIRE	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
P	●	●	●	●	●	●	●	●	●	●
Q	●	●	●	●	●	●	●	●	●	●
R	●	●	●	●	●	●	●	●	●	●
S	●	●	●	●	●	●	●	●	●	●

Figure 4-4 Seeking Switch for Tenth-Megacycle Autopositioner

SECTION V

MAINTENANCE

WARNING

VOLTAGES AS HIGH AS 375 VOLTS ARE PRESENT IN THIS EQUIPMENT. ALL TESTING SHOULD BE DONE WITH PROPER REGARD FOR THE DANGER INVOLVED. ALL REPAIRS OR TUBE REPLACEMENTS SHOULD BE MADE WITH THE PRIMARY POWER TURNED OFF OR DISCONNECTED.

1. GENERAL INSTRUCTIONS.

1.a. Equipment Necessary - The equipment normally required for testing and adjusting the 17L-3 Transmitter includes the following:

(1) Test control box as described in paragraph 1.b. Test Control Box, this section.

(2) Battery cart or other source of 26-28 V DC.

(3) Vacuum tube voltmeter such as RCA Voltohmyst, Jr. or Sylvania Polymeter.

(4) Phantom antenna such as TS-78/U (used with AN/ARC-1 and similar equipments) or VHF wattmeter such as Bird Model 61.

(5) Crank assembly for manual operation of Autopositioner system, Collins Part No. 505 2059 001.

(6) A tuning wand. This tool may be fabricated from a 1/4 inch diameter insulating rod approximately 4 inches long. Attach a 1/4 inch diameter by 3/8 inch long brass or copper slug to one end and a high frequency powdered iron slug of the same size to the other. When the non-ferrous slug is inserted into a coil it causes a partial short circuit, thereby decreasing the inductance; when the ferrous slug is inserted into the coil it increases the inductance.

(7) Audio oscillator such as Hewlett-Packard Model 200 or 650A.

(8) Grid dip oscillator such as Measurements Model 59 Megacycle Meter.

(9) Phantom microphone.

(10) Tube checker, such as Hickock Model 240 or 539A.

(11) Q meter or capacitance meter.

(12) Relay contact cleaning tool.

1.b. Test Control Box - For bench testing the 17L-3 Transmitter, some form of test control box which duplicates the control facilities of the aircraft installation is necessary. The schematic circuit diagram for a suggested test control box is shown in figure 5-1. An outline drawing of such a control box is shown in figure 5-2.

1.c. Replaceable Parts - The characteristics, manufacturer, and type number of all replaceable parts are listed in Section 6 - Parts List. If the replacement of any components becomes necessary, only parts identical or equivalent to those listed should be used.

1.d. Soldering - Only rosin-core solder should be used in making repairs. The use of acid flux or acid-core solder can cause destructive corrosion and severe electrical losses.

2. LUBRICATION.

The following points should be lubricated as specified at intervals of approximately six months.

TABLE 5-1

LUBRICATION

Point	Lubricant
a. Autopositioner Mechanism -	
(1) Pawl pivot	One drop AN-O-4 or AN-O-6a oil.
(2) Shaft Bearings	One drop AN-O-4 or AN-O-6a oil on each.
(3) Gear train	A small amount of AN-G-25 grease applied with brush to all gears.
b. Tuning Shafts -	
(1) Helical Gears	A small amount of AN-G-25 grease applied with brush.
(2) Shaft Bearings	One drop of AN-O-4 or AN-O-6a oil applied to all bearings.
(3) Cam follower rollers	One drop of AN-O-4 or AN-O-6a oil applied to each.
c. Autopositioner Switches -	Apply Fisk Bros. "Lubriplate No. 105" sparingly with brush. Remove excess lubricant.

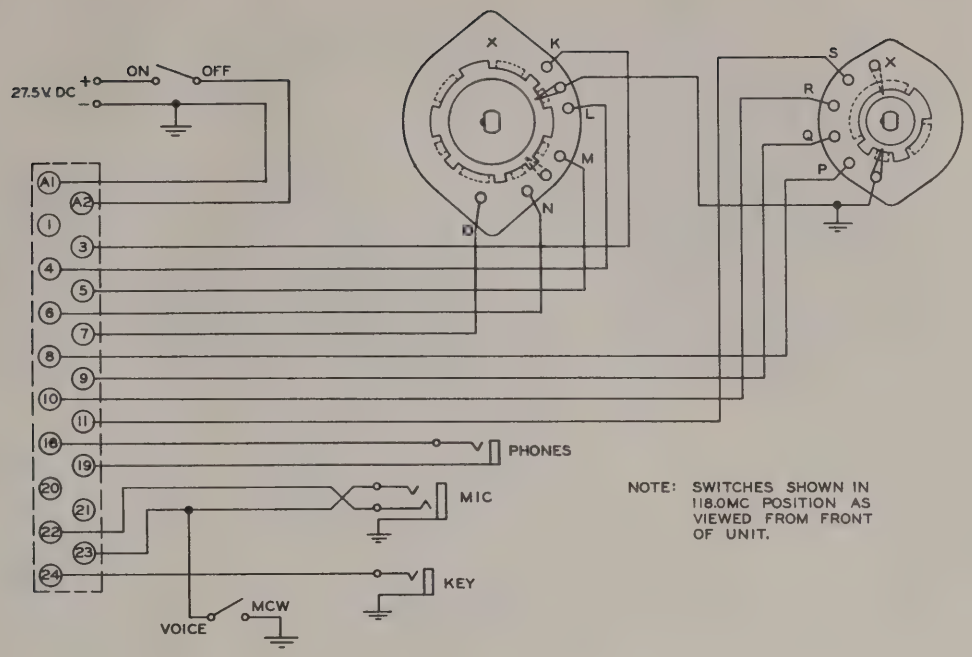


Figure 5-1 Test Control Box Schematic Circuit Diagram

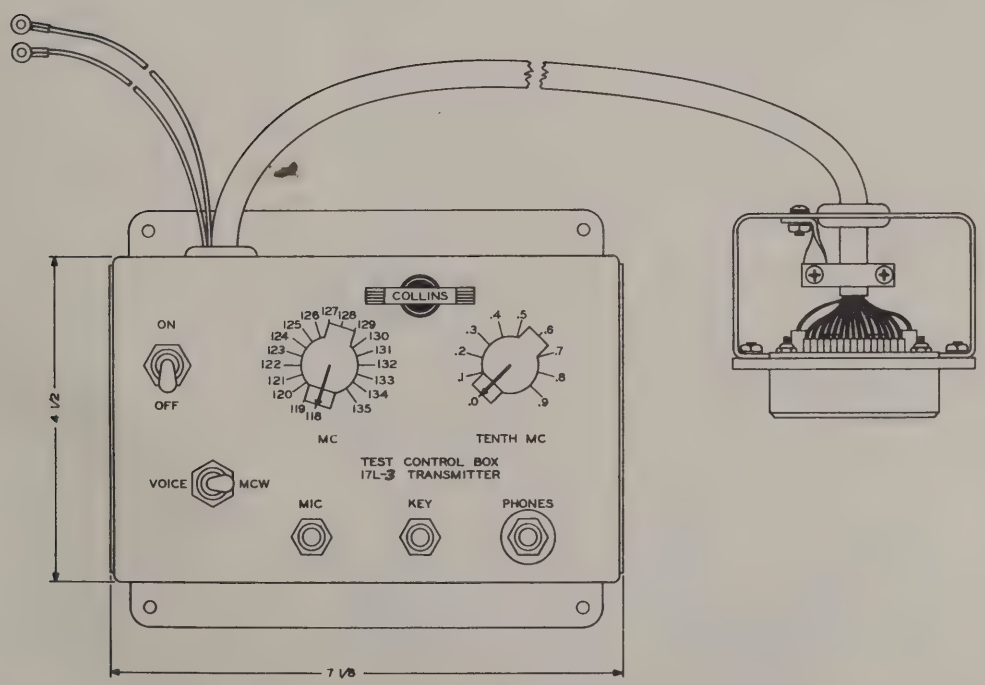
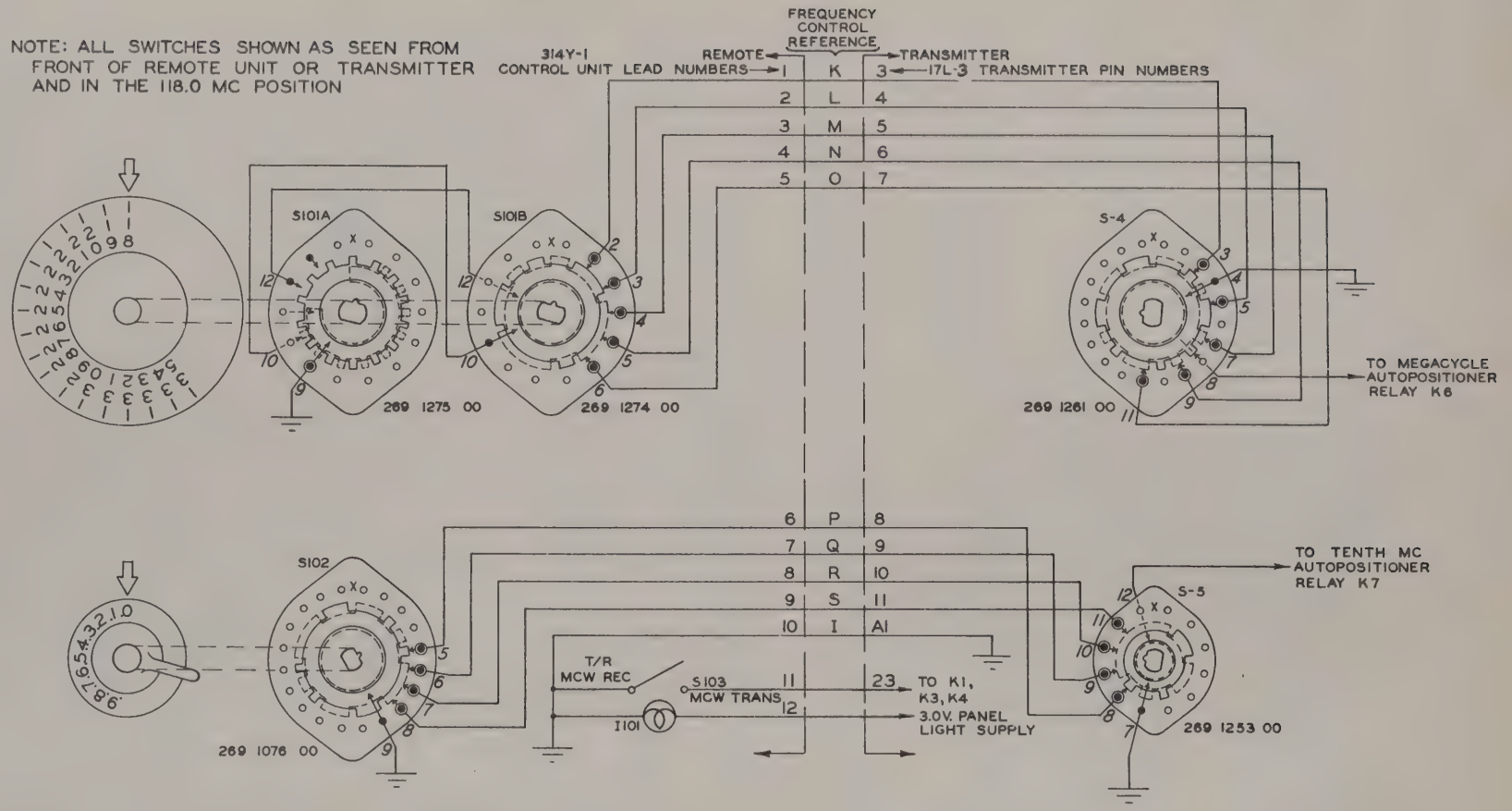


Figure 5-2 Test Control Box Outline Drawing



WIRE	MEGACYCLES																		
	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
K																		
L																		
M																		
N																		
O																		

WIRE	MEGACYCLES									
	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
P										
Q										
R										
S										

KEY
- CLIP ON FRONT
- CLIP ON REAR
- CLIPS FRONT & REAR (COMMON CONNECTION)

Figure 5-3 Schematic Circuit Diagram - Type 314Y-1
Frequency Control Unit

3. TABLE OF RESISTANCES AND VOLTAGES.

TABLE 5-2

RESISTANCE AND VOLTAGE MEASUREMENTS

This table of Resistances and Voltages lists the resistance to ground and d-c voltage to ground, (chassis), at significant points in the circuit. Resistances should be measured with primary power turned off. The voltages indicated were measured with an Electronic Designs Model 100 with the 17L-3 operating at a r-f carrier frequency of 126.0 mc. Resistances were measured with all relays in the de-energized position.

Tube No.	Pin No.	Resistance to Ground (Ohms)	Voltage to Ground (DC Volts)
V1	1	100K	-13
	2,7	620	4.1
	5	Infinite*	180
	6	Infinite*	135
V2	1	100K	9.4
	2,7	220	1.7
	5	Infinite*	180
	6	Infinite*	130
V3	1	100K	-14
	2,7	620	4.6
	5	Infinite*	180
	6	Infinite*	135
V4	1	100K	-3.65
	2,7	100	1.3
	5	Infinite*	162
	6	Infinite*	115
V5	1	100K	- 3.65
	2,7	100	1.3
	5	Infinite*	162
	6	Infinite*	115
V6	1	11K	-12.5
	2,7	100	2.1
	5	Infinite*	175
	6	Infinite*	138

*Greater than 1 megohm

Tube No.	Pin No.	Resistance to Ground (Ohms)	Voltage to Ground (DC Volts)
V7	1	11K	- 12.5
	2,7	100	2.1
	5	Infinite*	175
	6	Infinite*	138
V8	1	10K	- 3.6
	2,7	62	8
	5	Infinite*	235
	6	Infinite*	225
V9	1	10K	- 3.6
	2,7	62	8
	5	Infinite*	235
	6	Infinite*	225
V10	2	12K	- 20
	3	Infinite*	238
	4	200	25
	6	12K	- 20
	Plate Cap #1	Infinite*	350
	Plate Cap #2	Infinite*	350
V11	1	Infinite*	265
	2	78K	0
	3	1K	10
	6	Infinite*	260
	7	100K (max)	0
	8	820	8.6
V12	3	Infinite*	320
	4	Infinite*	300
	5	1700	0
	8	227	17.5
V13	3	Infinite*	320
	4	Infinite*	300
	5	1700	0
	8	227	17.5

*Greater than 1 megohm

4. GENERAL TROUBLE SHOOTING.

4.a. General - If it is definitely known that a certain section is at fault, remove the transmitter from the shockmount and bench test it in accordance with instructions included in the following paragraphs headed 4.c. Control Circuits, 4.d. Filament Circuits, etc., as required. If the section at fault has not been determined, proceed as follows:

(1) Remove faulty transmitter from the plane and replace it with one known to be in good condition.

(2) Operate transmitter, allowing tube filaments 20 seconds to warm up before pressing push-to-talk button on microphone. If this second transmitter fails to function properly, the trouble is probably in the installation wiring. In this case proceed directly to paragraph 4.b. Installation Wiring, this section.

(3) If the second transmitter operates satisfactorily, move the faulty transmitter to a test bench and connect it to a source of 27.5 V DC power by means of a test control box as described in paragraph 1.b. Test Control Box, this section, and to a phantom antenna such as one of those listed in paragraph 1.a. (4) this section.

(4) Apply primary power. The dynamotor should not start. If it does, proceed to paragraph 4.3. Dynamotor Power Supply, this section, for trouble shooting suggestions. The Autopositioner mechanism should operate and come to a stop within 3 seconds in a position such that the test control box Autopositioner switch settings and the settings of transmitter switches S-4 and S-5, as seen from the front of the transmitter with the front cover removed, are identical. If not, remove power and refer to paragraph 4.c. Control Circuits.

(5) Observe tube filaments and make sure that all are lighted, however, they should not be excessively bright. If in doubt as to the condition of the filament circuit, refer to paragraph 4.d. Filament Circuits, and check voltages.

(6) Observe the unit carefully for indication of overheating. Refer to the table of resistances and voltages, paragraph 3, and the main schematic diagram, figure 7-1, to aid in locating the trouble.

(7) If there is no overheating, or after this difficulty has been corrected, throw the meter switch S-3 to the ANT position and plug a microphone and pair of 500 ohm phones into the jacks in the test control box.

(8) Press the microphone push-to-talk button; the dynamotor should start. If not, refer to paragraph 4.3. Dynamotor Power Supply.

(9) Observe the test meter, M-1, on the front panel. Satisfactory power output will be indicated by a reading of 4 units, or more. If a reading is non-existant or low, refer to paragraph 4.f. R-F Circuits.

(10) Talk and/or whistle into the microphone and listen to the earphones. Proper operation will be indicated by a strong signal (its amplitude may be adjusted by means of the sidetone level control, R-41, on the front panel of the transmitter). If a strong signal is not heard, refer to paragraph 4.g. Audio Circuits.

(11) Observe the reading on the TS-78/U phantom antenna or Bird wattmeter. Power output of 8 watts or more should be indicated. If such is not the case, refer to paragraph 4.h. Antenna Circuit.

(12) Operate the transmitter on a sufficient number of channels so that all of the crystals installed have been used. Satisfactory power output and satisfactory modulation should be observed on all of the 180 channels. Include as test frequencies, the high and low points of the frequency range; i.e., 118.0 mc and 135.9 mc (or 131.9 mc if that is the highest frequency used). If satisfactory power output cannot be obtained on some channels and yet re-tracking does not appear to be necessary, refer to paragraph 5.i. Antenna Tuning.

4.b. Installation Wiring - If preliminary tests indicate trouble in the installation wiring of the aircraft -

(1) Make sure that the radio equipment is being inserted far enough onto the shockmount so that the rear-mounted plugs are making good contact with the shockmount receptacles.

(2) Check to make sure the shockmount is being properly grounded to the aircraft structure.

(3) Check continuity of circuits showing faulty operation. If the operation of the Autopositioner frequency changing system is faulty, the trouble may be in either the installation wiring or in the transmitter circuits. Paragraph 4.c. (1) provides a trouble-shooting guide for the Autopositioner system.

4.c. Control Circuits - The control circuits may be divided roughly into two types, (1) the channeling mechanisms for selecting the desired channel, and (2) the various control and relay circuits for operation of the transmitter itself. The two are quite closely inter-related and will be treated together in this section.

(1) Channeling Mechanism. Before attempting to adjust or locate trouble in the Autopositioner system, the theory of operation should be thoroughly understood. Refer to Section III of this book. The procedure outlined below should be followed.

(a) Localize the trouble; i.e., find out whether the trouble is mechanical jamming of the gear trains or crystal switches (or slug rack in the case of the megacycle Autopositioner). See paragraph 5.a. Adjustment of One Megacycle Crystal Switch and Slug-Rack, or 5.b. Adjustment of Tenth Megacycle Crystal Switch, this section. The following trouble shooting guide is provided to aid in localizing the trouble.

(b) Trouble Shooting Guide.

1. Trouble - Motor continues to run after Autopositioner sets up.

Possible Causes -

a. Relay contacts bent; see paragraph 5.a.(3), this section, for the relay adjustment procedure.

b. Spring weak, pawl does not seat fully; replace relay, replace spring, or remove and bend spring to increase tension.

c. Seeking switch out of synchronization causing pawl to drop late and catch on far side of notch and not seat fully; adjust switch stack.

d. Intermittent or continuous short to ground on negative side of motor.

2. Trouble - Autopositioner sets up on wrong channel part of time.

Possible Causes -

a. Broken wire or poor connection on one or more control wires. Note which channels give ambiguous results; from figure 5-3, note which wire differentiates between these ambiguous channels; this wire is probably open.

b. Open circuit between ground and front side of remote switch. Note whether Autopositioner sets up on wrong channel for which code given in figure 5-3 is exactly opposite to code for proper channel. This indicates no ground on remote switch. Check by grounding front blade (by means of long clip) on remote switch when Autopositioner sets up improperly.

3. Trouble - Autopositioner sets up on some channels, runs continuously on others.

Possible Causes -

a. Control wires shorted to ground. From code on figure 5-3, note whether one wire is supposed to be grounded on the channels which are working properly, and ungrounded on the others; this wire may be shorted to ground.

b. Control wires shorted to each other. From code determine whether two (or more) wires are supposed to have same connections (both grounded or both ungrounded) on all properly working channels, opposite connections on all other channels. These wires may be shorted.

c. Switch out of synchronization, allowing pawl to drop too early or too late on some channels. Check visually when set up.

4. Trouble - Autopositioner does not set up on any channel, stop-wheel turns freely, relay opens momentarily each revolution of shaft.

Possible Causes -

a. Spring bent, pawl does not engage stop wheel with sufficient force to hold.

b. Switch out of synchronization.

c. Pawl sticks on its pivot.

d. Relay shifted, does not allow pawl to seat properly.

e. Pawl tip shape altered severely, does not hold.

5. Trouble - Autopositioner does not set up on any channel, stop wheel turns freely, relay remains energized continuously.

Possible Causes -

a. Wire from relay to seeking switch grounded.

b. Rear switch blade grounded by short between rear and front blades.

c. Several or all control wires shorted to ground.

d. Rear blade of remote switch grounded, possibly by short between rear and front blades.

6. Trouble - Autopositioner does not set up, stop-wheel does not turn freely, relay energized, motor running.

Possible Causes -

a. Pawl does not lift clear of notch.

i. Relay shifted away from pawl.

ii. Relay has insufficient travel; see paragraph 5.a.(3)(f), this section, for relay adjustment procedure.

b. Slug table jammed by physical obstruction.

c. Gears (or slug rack in the case of the megacycle Autopositioner) jammed.

d. Autopositioner (or slug table) bearings out of alignment, binding shaft.

e. Pawl sticks on its pivot.

f. Improper lubrication on bearings (at low temperatures).

g. Insufficient clutch torque.

i. Broken clutch springs.

ii. Glazing of clutch surfaces.

7. Trouble - Autopositioner sets up, then recycles by itself.

Possible Causes -

a. Spring bent, does not hold pawl in notch properly.

b. Relay shifted, pawl does not seat fully.

c. Pawl tip altered, excessive slope or radius causes pawl to be pushed out of slot.

d. Intermittent short circuit between control wires or from wires or switch to ground.

e. Switch out of synchronization, operation marginal.

f. Broken control wire or intermittent open circuit may allow Autopositioner to set up on wrong channel, then close circuit momentarily to drive the Autopositioner on to proper channel.

8. Trouble - Autopositioner relay closes, motor does not run.

Possible Causes -

a. Relay contacts bent, not closing motor circuit.

b. Open circuit from relay to motor.

c. Moving contact not grounded properly to frame, or frame to panel.

d. Contacts dirty.

e. Moving contact bent (or temper lost as result of short circuit), not sufficient contact pressure.

f. No power on positive side of motor.

g. Motor armature burned out.

h. Motor field (permanent magnet) de-magnetized.

i. Reduction gears jammed; check by turning manually.

9. Trouble - Autopositioner relay does not operate.

Possible Causes -

a. No power on positive side of relay.

b. Open circuit from relay to seeking switch.

c. Control wire circuit open.

d. Relay coil burned out.

e. No air gap on relay.

(2) Relay Circuits

(a) During the channeling period, antenna transfer relay K-1 and power and audio transfer relay K-4 should be de-energized. Failure of these relays to release will probably be caused by failure of Autopositioner interlock relay K-2 to operate. Failure of only one of the relays to function will probably be caused by the relay itself or wiring. The dynamotor relay, K-3, should be unaffected by channeling.

(b) Pressing the push-to-talk switch on the microphone should energize antenna transfer relay K-1, dynamotor relay K-3 and power and audio transfer relay K-4. Closing the microphone switch grounds the return side of the relays. Relay K-3 has heavy, double-break contacts to carry the surge loads. The contacts of this relay may cause trouble by sticking after the relay coil is de-energized. Complete lack of high voltage may well be due to the failure of power and audio transfer K-4 to operate.

(c) Relay contacts should be cleaned with a burnishing tool.

4.d. Filament Circuits - In the event of filament circuit failure, the procedure given below should be followed in locating the trouble.

(1) Be sure that all tubes are of the proper type and that all are pressed firmly into their sockets. Inspect tube socket clips to insure the clips are making good pin contact.

(2) Measure the voltages to ground at V-4 pin 3, V-9 pin 3, and V-13 pin 2. All should measure 27.5 V DC.

(3) Measure the voltages to ground at V-5 pin 4, V-1 pin 4, V-12 pin 2 and V-8 pin 4. All should measure 21 V DC.

(4) Measure the voltage to ground at the junction point of R-55, R-56, R-57 and R-58. It should measure 13 to 14 V DC.

(5) Measure the voltages to ground at V-3 pin 4, V-6 pin 3, and V-11 pin 4. All should measure 12.6 V DC.

(6) Measure the voltage to ground at V-10 pin 7. It should measure 12.6 V DC.

(7) Measure the voltage to ground at V-2 pin 4 and V-7 pin 4. They should measure 6.3 V DC.

(8) If any of the above voltages do not check, change tubes or resistors, as required, to eliminate the cause of deviation from correct value.

(9) Be sure that metal shields are firmly in place around all miniature tubes and that the spring holders of V-10 are firmly in place.

4.e. Dynamotor Power Supply

(1) Check connections to terminal board E-1. The schematic, figure 7-1, indicates the color code of the wires.

(2) Trouble Shooting

(a) Trouble - Will not start.

Possible Causes -

1. K-3 fails to close

2. Brushes worn out

3. Open in motor armature or field

(b) Trouble - Will not stop.

Possible Causes -

1. Contacts of K-3 burned together

2. K-3 fails to release when de-energized

3. Wire from E-1, terminal 1 shorted to ground

4. Negative side of motor shorted to ground inside of dynamotor.

(c) Trouble - Dynamotor runs, but no high voltage to transmitter

Possible Causes -

1. K-4 does not close.

2. Brushes worn out

(d) Trouble - Ripple voltage high

Possible Causes -

1. C-57 open

(e) Trouble - Dynamotor runs but no receiver voltage

Possible Causes -

1. K-4 not releasing

2. K-4 contacts dirty

3. R-62 open

4. R-61, C-68 or C-69 shorted.

4.f. RF Circuits - Troubles in the r-f circuits can usually be isolated by using the test meter, M-1. Many times, especially if the equipment has been tampered with, there may be no actual failure in the circuit but rather one or more tuned circuits fails to track over the band. In this case, refer to the applicable portion of the alignment procedure, paragraph 5, this section. When trouble shooting in the r-f stages, use the tuning wand as described in paragraph 1.2.(6), this section and refer to the voltage and resistance measurements of paragraph 3, this section, the main schematic diagram, figure 7-1, and the theory of operation section (Section III). Unless the trouble has been isolated to one or more stages, proceed as follows:

(1) Isolating Trouble - Refer to the schematic, figure 7-1. The trouble can often be "isolated" to a certain stage by the use of test meter M-1. Beginning at the transmitter output circuit (meter switch in ANT. position), check meter readings against those given below. A low meter reading will usually indicate the stage at fault. When the trouble has been isolated to a stage, or in the case of the exciter and audio section, a series of stages, refer to the table of voltage and resistance measurements and the following paragraphs for suggestions on stage trouble shooting.

Satisfactory Test Meter Readings

Switch Position	Readings (Units)
ANT.	4 or more
PA GRID	3 or more
DR GRID	1 or more
MIX GRID	6 or more

(2) If the meter reading with the switch in the MIX GRID position is low or nonexistant, the difficulty is probably in the exciter. Check the exciter as indicated in the following paragraphs.

(3) If a satisfactory reading is not obtained with the switch in the MIX GRID position, disable the tenth mc oscillator by removing a crystal or by setting the selector switch to a blank position and check the output of the megacycle oscillator-frequency multiplier section over the frequency range of 118 to 135 mc. A reading of at least three units should be registered on M-1 for any setting of the megacycle positioner switch.

(4) If a satisfactory reading is not obtained, refer to paragraph 4.f.(8), Megacycle Oscillator-Frequency Multiplier, this section.

(5) If the conditions of paragraph (3) above, are met, disable the megacycle oscillator by removing a crystal or setting the selector switch to a blank position and check the output of the tenth megacycle oscillator over the range from .0 to .9 mc. A reading of at least three units should be registered on M-1 for any setting of the tenth megacycle positioner switch.

(6) If the conditions of paragraph (5) above, are not met, proceed to paragraph 4.f.(9) Tenth Megacycle Oscillator-Frequency Multiplier, this section.

(7) Megacycle Oscillator - Frequency Multiplier

(a) With a vacuum tube voltmeter, check the grid drive of the oscillator V-1, pin 1. It should register approximately -13 V DC. Complete lack of this drive on one or more positions of the megacycle positioner switch will usually be caused by the rotor of S-1 failing to make contact with the proper switch contact, in which case, proceed to paragraph 5., Alignment, this section. However, an open lead or bad crystal may have the same effect. Weak drive may be caused by a low activity crystal. Wrong input capacitance may have the same effect, in which case refer to paragraph 5.c., Adjustment of C-30, this section.

(b) Check the grid drive of V-4 and V-5. About -3.5 V DC should be indicated on all positions of S-1.

(8) Tenth Megacycle Oscillator - Frequency Multiplier:

(a) With a vacuum tube voltmeter, check the drive to the grid of the tenth megacycle oscillator V-3. About -15 V DC should be measured. Complete lack of drive may be caused by bad contact of the S-2 rotor with a switch contact (see paragraph 5.b., Adjustment of Tenth Megacycle Crystal Switch, this section) or an open lead to the switch, etc. Low drive may be caused by a low activity crystal.

(b) Proceed to paragraph 5.e. Adjustment of Z-1, this section.

(c) If Z-1 fails to indicate resonance at 28.4 mc, more detailed study of the circuit will be required.

(9) Balanced Mixer

(a) Replace V-6 and V-7, one at a time, with type 5654 (6AK5) tubes known to be in good condition.

(b) If this does not produce proper drive, more detailed inspection of the circuit components will be required.

(10) Driver

(a) Replace V-8 and V-9 one at a time with type 6AR5 tubes known to be in good condition.

(b) If this does not bring up the P.A. grid current as indicated on M-1, more detailed inspection of the circuit components will be required.

NOTE

LACK OF P.A. GRID CURRENT, WHILE DRIVER GRID CURRENT IS KNOWN TO BE SATISFACTORY, DOES NOT ALWAYS INDICATE TROUBLE IN THE DRIVER CIRCUIT. QUITE OFTEN A FAULTY 832A (V-10) POWER AMPLIFIER WILL CAUSE THE TROUBLE. OTHER TROUBLES IN THE P.A. CIRCUIT MAY CAUSE LOW DRIVE.

(c) It is necessary that the P.A. grid drive be sufficient to sustain upward modulation; i.e., an increase in antenna power when the final amplifier is modulated as indicated by an oscilloscope or lamp-type load.

(11) Power Amplifier

(a) Replace V-10 (832A) with a tube known to be in good condition.

(b) If this fails to remedy the trouble, throw S-3 to the PA CATH position. A reading of approximately 4.0 meter units should be obtained. If there is no indication of cathode current, check cathode screen and plate circuits thoroughly.

(b) Check with the tuning wand for a dip in cathode current at resonance. If the circuit is not tuned, refer to paragraph 5.h. for the P.A. tank circuit adjustment procedure; however, antenna current must be indicated on M-1 before tracking can be begun. It may be necessary to check the output circuit thoroughly to locate troubles.

4.g. Audio Circuits - In case of trouble in the audio circuits, the following procedure is recommended.

(1) Plug a carbon microphone and a pair of 500 ohm phones into the jacks provided on the test control box.

(2) Throw the ON-OFF switch to ON; wait 20 seconds for the filaments to warm up.

(3) Press the push-to-talk button on the microphone.

(4) Talk and/or whistle into the microphone.

(5) Listen to the phones. A loud and clear signal should be heard. The amplitude of this sidetone may be adjusted by R-41 on the front panel.

(6) If a loud clear signal is not heard, observe the meter M-1 with S-3 in the ANT position.

(7) If the reading is at least mid-scale, check the sidetone amplifier (V-11A) circuit, including the rectifier CR-1 and filter.

(8) If the V-11A circuit seems to be as it should be, check the power and audio relay K-4.

4.h. Antenna Circuit - If the antenna current as indicated on M-1 with S-3 in the ANT position is 4 units or more but satisfactory output is not obtainable as indicated on the TS-78U or Bird meter, the following tests of the antenna circuit should be made.

(1) Check for continuity from the center conductor of J-1 (antenna connector) to L-19 with the antenna transfer relay (K-1) in the energized position. If K-1 fails to make a good contact, clean the contacts with a burnishing tool.

(2) Energize the transmitter by pressing the push-to-talk button of the microphone. Relay K-1 should be energized.

(3) Check the dummy load circuit itself.

5. ALIGNMENT PROCEDURE.

In the event that it becomes necessary to realign one or more stages of the 17L-3 Transmitter, the procedure outlined below should be followed. Any paragraph that is not applicable to the case in question should be omitted. Care should be taken, in fact, to avoid adjustments on circuits or mechanisms that are functioning satisfactorily.

5.a. Adjustment of One Megacycle Crystal Switch and Slug Rack.

(1) By means of the test control box, as described in paragraph 1.b., this section, operate the channeling mechanism and make sure that the reading on the remote head is the same as that on the pawl wheel of the transmitter driven switch (S-4) relay assembly, as seen through the slot on the relay mechanism with the front panel removed.

(2) Loosen the couplers on the slug rack cam shaft and the cams which operate the slug rack.

(3) If it is necessary to replace the Autopositioner relay or to realign it for any reason, proceed as follows:

(a) Seat pawl in a notch of the stop wheel. Turn the gear train by hand to allow the pawl to seat fully.

(b) Place relay so that the pawl finger comes between the relay spring and frame at about the middle of the spring.

(c) Line up the mounting hole farthest from the pawl and start this mounting screw without applying any pull to the relay spring (let the relay turn clockwise slightly).

(d) Turn the relay counterclockwise about this screw, which will let the pawl finger slide between the spring and relay arm. Start the second screw.

(e) Hold the pawl fully seated in the stop wheel notch and hold the relay frame against the pawl finger. Tighten mounting screws. Check to be certain that pawl is fully seated and that the relay clapper and arm have no appreciable free play. Reposition relay if necessary to meet these conditions.

(f) Press the relay clapper and turn the Autopositioner manually or under power, and check the clearance between the pawl tip and stop wheel. This should be approximately 1/64" or less. If adjustment is required, loosen the two screws near the hinge point and slide the hinge plate up or down as required. (Adjustment may be aided by placing a .020" feeler gauge between the clapper and coil core.) Be careful that relay arm does not rub on side of relay frame or against stop wheel and that spring does not shift closer to contacts when tightening these screws.

(g) Check operation of motor contacts. With power off, press clapper of relay and turn gearing to let pawl tip rest on stop wheel between notches. In this position, motor-operating contacts should be closed and the clapper and arm should have a small amount of free play to permit full contact pressure at the contact points. If necessary, bend the stationary contact in or out. Failure to make contact in this position may allow the Autopositioner to "set up" at the wrong position, with the seeking switch circuit open but with the pawl between notches; excessive free play of the clapper in this position indicates insufficient contact opening in the de-energized position.

(4) Make sure that the cam shaft and crystal switch (S-1) rotate freely.

(5) Turn the slug rack cam shaft by hand until an ohmmeter or similar continuity meter, plugged into the proper crystal socket for the reading on the pawl wheel, indicates that S-1 is in the proper position. It is usually

necessary to lead the switch; i.e., rotate the switch rotor past its normal position, to allow for backlash in the gear trains.

(6) Tighten the coupler from the gear train to the cam shaft and operate the Autopositioner mechanism. The meter should indicate that contact is being made when it is plugged into the proper crystal socket.

(7) It is important the S-1 rotor blade be centered under the contacts. Since there are 20 positions, a few degrees error in either direction may cause poor contact or none at all. This may be checked by sight or, since the rotor blade and contacts are difficult to see, it may be checked in the following manner.

(a) Turn the power on-off switch to the off position.

(b) Connect the continuity meter in the crystal socket following the socket corresponding to the switch setting, as read on either the remote head or the pawl wheel. For example, if remote head indicates 119 mc, the switch is connected to crystal No. 2, so connect the meter in crystal socket No. 2.

(c) Lift the pawl out of the pawl wheel by hand, being careful not to lift it too high as it may bend the spring beyond its elastic limit, and turn the gear train by means of the hand crank (as described in paragraph 1.a.(5), this section) placed in the holder provided near the Autopositioner motor.

(d) Turn the mechanism by means of the crank until the meter indicates that contact is being made by the rotor blade and the S-1 contact following the previous contact.

(e) Count the number of revolutions of the hand crank up to the point where the pawl drops into the pawl wheel; then lift the pawl again and continue counting until the meter indicates that the S-1 rotor has opened from the contact in question. The pawl should have dropped into the pawl wheel very close to the center of contact, e.g., if 12 revolutions of the crank were counted from the beginning to the end of the contact, the pawl should have dropped into the pawl wheel within one or two revolutions of the 6th revolution.

(f) Holes in the crystal board permit inspection of the switch contacts. Contracts are visible at 125, 126 and 135 mc.

(8) Turn the power switch on and run the remote head to the 118 mc position. Set the slug rack cam rollers about 5 degrees past the lowest point on the cam with the cam longitudinally centered on the cam rollers. Tighten the couplers and rotate the remote head to the 135 mc position. The cam rollers should be nearly to the highest position on the cams but not yet onto the "return" portion.

5.b. Adjustment of Tenth Megacycle Crystal Switch - The procedure to be followed here is similar to that followed in paragraph 5.a., this section, except that 5.a.(8) is omitted. A hole in the crystal board permits the contacts to be inspected at the .4 and .5 mc positions.

5.c. Adjustment of C-30, Megacycle Oscillator Grid Trimmer Capacitor.

(1) Plug crystal Nos. 1-3 and 5-18 into the 18 position crystal board. Rotate the remote head to the 121 mc position, and after the transmitter driven switch (S-4) mechanism has positioned properly, turn the power switch to off.

(2) Set the internal capacity of a Q-meter to 80 uuf and, with a short shielded lead attached to the Q-meter capacitor terminals only, tune the Q-meter by means of the frequency control using a coil having sufficient inductance for tuning somewhere in the region of 8 to 15 mc.

(3) Set the internal capacity of the Q-meter to 48 uuf or 32 uuf less than before. Plug the other end of the short shielded lead into crystal socket No. 4, making sure that the shield is plugged into the ground side of the crystal socket. Without further adjustment of the Q-meter adjust C-30 for resonance of the Q-meter. It is important that the filament of V-1 be not lit for this adjustment; however, V-1 must be in its socket.

(4) Plug Crystal No. 4 into the 18 position crystal board.

5.d. Adjustment of Ferrous Slug Tuned Tank Circuits of V-1, V-2, and V-4 and 5, and Non-Ferrous Slug Tuned Grid Tank Circuit of V-6 and V-7.

(1) With the slug rack in the 118 mc position, set the bottom ends of the ferrous slugs to the following distances from the bottom end of the wrap-around assembly:

Slug	Distance in Inches
L2	1-1/4
L3	1-3/16
L4	1-1/8
L9	1-3/32
L-12	Top of slug under center of second turn of coil as viewed from above coil assemblies.

(2) Turn the transmitter on and, using a grid dip oscillator or wave meter for indication, tune C-5 and C-8 for resonance of the first two tuned circuits at 30 megacycles.

(3) Tune C-13 and C-27 for resonance of the next two tuned circuits at 90 mc.

(4) Insert the non-ferrous slug of L-12 about a half turn into L-12 and tune C-31 for maximum on the grid dip meter.

(5) Turn the meter switch (S-3) to the MIX GRID position, and readjust C-5, C-8, C-13, C-27, and C-31 for maximum on M-1.

(6) Go up in frequency in 3 mc steps, checking each stage for resonance by first inserting a small non-ferrous slug and then a ferrous slug (a tuning wand is described in paragraph 1.a.(6), this section) into the coil forms through the holes provided in the wrap-around case. It may be necessary, in certain cases, to reposition one or more ferrous slugs of L-2, L-3, L-4, and L-9.

(7) After the whole band of 90 to 107 mc has been covered, repeat the above steps until satisfactory tracking has been obtained. Adjust slug in L-12 slightly, if necessary, to obtain proper tracking. Slug should not be moved more than a turn or two on the adjusting screw.

5.e. Adjustment of Z-1 - I.F. Type Transformer

(1) Remove crystal No. 1 from the megacycle bank of crystals and dial the megacycle positioner mechanism to the 118 position or disable the oscillator by setting the selector to a blank channel.

(2) Plug crystals Nos. 19-28 into the tenth megacycle crystal board and dial the tenth megacycle positioner to the 0.4 position.

(3) Tune the slugs of Z-1 for maximum on M-1 with S-3 in the MIX GRID position.

(4) Dial the tenth megacycle positioner from 0.0 to 0.9, noting the reading on M-1 for each setting of the positioner. A fairly constant reading of approximately 4 meter units should be obtained.

(5) Replace crystal No. 1. M-1 should now read at least 6 units for any frequency setting. Retracking of one or more stages may be necessary to accomplish this.

5.f. Adjustment of Driver Grid Tank Circuit.

(1) Set the non-ferrous slug of L-14 so that top of slug is under center of first turn of coil as viewed from above coil assemblies.

(2) At 118.4 mc adjust C-39 for maximum reading on M-1 with S-3 in the DR GRID position.

(3) Go up in frequency about 3 mc leaving the tenth megacycle position at 0.4. The driver grid tank and the following tanks are designed to pass a 1 megacycle band and are peaked at the center of each megacycle band.

(4) Adjust C-39 and the slug of L-14 until the insertion of either a ferrous or non-ferrous slug into the coil form through the access hole provided in the wrap-around case causes the driver grid current meter reading to drop, indicating that resonance has been obtained. Resonance checks for this stage and the following stages should be made either with the shields in place or with a flat aluminum plate held in place over the tuned circuits.

(5) Repeat step (4) every three megacycles.

(6) After the entire band has been covered, repeat steps (1) and (3) through (6), (note that C-39 should not be readjusted) until further improvement cannot be made. Final adjustment should be made after the P.A. grid circuit is aligned so that P.A. grid current can be used as a tuning indication.

5.g. Adjustment of P.A. Grid Tank Circuit - The adjustment of the P.A. grid tank circuit is similar to the adjustment of the driver grid tank circuit with S-3 now in the PA GRID position. The meter reading should be at least mid-scale over the entire band.

5.h. Adjustment of P.A. Plate Tank Circuit - The adjustment of the P.A. plate tank circuit is similar to the adjustment of the driver grid and P.A. grid tank circuits with S-3 now in the ANT position. A 52 ohm load such as a Bird Model 61 or TS-78U phantom antenna, should be connected to the antenna jack before tracking this circuit. Resonate the power amplifier plate tank by adjusting the slug in L-18 and the antenna trimmer C-54. The slug should be located so that the top of the slug is at the middle of the second turn at 118.0 mc. The reading of M-1 in the ANT position should be at least mid-scale for any setting of the megacycle Autopositioner.

SECTION VI

PARTS LIST

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
A1	PANEL ASSEMBLY - front; consists of panel, self-clinching fasteners, and bearings 01, 02, 03, 04, 05, 06.		504 4135 003
A2	HANDLE - carrying, stainless steel		503 5086 002
A3	BRACKET - hold-down.		503 4970 001
A4	BRACKET - hold-down; same as A3		
A5	PLATE ASSEMBLY - autopositioner; consists of plate, self-clinching fasteners, bearing 010 and stud 011		503 7090 002
A6	PLATE ASSEMBLY - autopositioner; same as A5		
A7	PLATE ASSEMBLY - gear; consists of gear plate and bearing 017, 018, and 019		504 9375 002
A8	GUIDE ASSEMBLY - front; includes bearing 040		504 4090 002
A9	GUIDE ASSEMBLY - rear; includes bearing 043		504 4091 002
A10	TUNING TABLE ASSEMBLY - complete; consists of tuning table, cam followers, tuning core adjusting screws H28, nuts H29 and associated hardware.		561 0045 002
B1	MOTOR: 27.5 vdc permanent magnet motor	Autopositioner motor	561 0095 003

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
C1	CAPACITOR: fixed; 12 mmf p/m 2%; 500 vdcw; ceramic	V1 feedback	916 4176 00
C2	CAPACITOR: fixed; 100 mmf p/m 2%; 500 vdcw; ceramic	V1 cathode bypass	916 4058 00
C3	CAPACITOR: fixed; 2400 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V1 screen bypass	912 0005 00
C4	CAPACITOR: fixed; 2400 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V1 plate decoupling	912 0005 00
C5	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V1 plate tank trimmer	917 1013 00
C6	CAPACITOR: fixed; 36 mmf p/m 5%; 500 vdcw; ceramic	V1 plate tank	916 4448 00
C7	CAPACITOR: fixed; 30 mmf p/m 5%; 500 vdcw; ceramic	V2 grid tank	916 4438 00
C8	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V2 grid tank trimmer	917 1013 00
C9	CAPACITOR: fixed; 51 mmf p/m 5%; 500 vdcw; ceramic	V1 output coupling	916 4294 00
C10	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	Va cathode bypass	912 0420 00
C11	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V2 screen bypass	912 0420 00
C12	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V2 plate decoupling	912 0301 00
C13	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V2 plate tank trimmer	917 1013 00
C14	CAPACITOR: fixed; 7 mmf p/m 1 mmf; 500 vdcw; ceramic	V2 plate tank	916 4161 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
C15	CAPACITOR: fixed; 15 mmf p/m 2%; 500 vdcw; ceramic	V3 feedback	916 4179 00
C16	CAPACITOR: fixed; 100 mmf p/m 2%; 500 vdcw; ceramic	V3 cathode	916 4058 00
C17	CAPACITOR: fixed; 1500 mmf p/m 20%; 350 vdcw; ceramic	V3 screen bypass	913 0393 00
C18	CAPACITOR: fixed; 1500 mmf p/m 20%; 350 vdcw; ceramic	V3 plate decoupling	913 0393 00
C19	CAPACITOR: fixed; 30 mmf p/m 1%; 500 vdcw; ceramic	V3 plate tank	913 0514 00
C20	CAPACITOR: fixed; 1500 mmf p/m 20%; 350 vdcw; ceramic	V4, V5 grid balancing	913 0393 00
C21	CAPACITOR: fixed; 36 mmf p/m 1%; 500 vdcw; ceramic	V4, V5 grid	913 0518 00
C22	CAPACITOR: fixed; 5 mmf p/m 1/4 mmf; 500 vdcw; ceramic	V2 to V4	916 4384 00
C23	CAPACITOR: fixed; 5 mmf p/m 1/4 mmf; 500 vdcw; ceramic	V2 to V5 coupling	916 4384 00
C24	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V4 & V5 cathode bypass	912 0420 00
C25	CAPACITOR: fixed; 500 mmf p/m 20%; 50 vdcw; oil impregnated silver mica	V4 & V5 screen bypass	912 0420 00
C26	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V4 & V5 screen bypass	912 0420 00
C27	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V4 & V5 plate tank trimmer	917 1013 00
C28	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V4 & V5 plate decoupling	912 0301 00
C29	CAPACITOR: fixed; 7 mmf p/m 1/2 mmf; 500 vdcw; ceramic	V4 & V5 plate tank	916 4161 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
C30	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V1 crystal correlation	917 1013 00
C31	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V6 & V7 grid tank	917 1013 00
C32	CAPACITOR: fixed; 5 mmf p/m 1/4 mmf; 500 vdcw; ceramic	V6 input coupling	916 4384 00
C33	CAPACITOR: fixed; 5 mmf p/m 1/4 mmf; 500 vdcw; ceramic	V7 input coupling	916 4384 00
C34	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V6 & V7 cathode bypass	912 0420 00
C35	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V6 & V7 screen bypass	912 0420 00
C36	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V6 & V7 screen bypass	912 0420 00
C37	CAPACITOR: fixed; 1000 mf p/m 20%; 500 vdcw; ceramic feedthru	V6 & V7 plate de-coupling	913 0716 00
C38	NOT USED		
C39	CAPACITOR: variable; 7 max to 1.5 min mmf; 500 vdcw; ceramic	V6 & V7 plate tank trimmer	917 1013 00
C40	CAPACITOR: fixed; 15 mmf p/m 5%; 500 vdcw; ceramic	V8 input coupling	916 4412 00
C41	CAPACITOR: fixed; 15 mmf p/m 5%; 500 vdcw; ceramic	V9 input coupling	916 4412 00
C42	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V8 & V9 cathode bypass	912 0420 00
C43	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V8 & V9 screen bypass	913 0420 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
C44	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V8 & V9 screen bypass	912 0420 00
C45	CAPACITOR: fixed; 1000 mmf p/m 20%; 50 vdcw; ceramic feedthru	V8 & V9 plate decoupling	913 0716 00
C46	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V4 & V5 cathode bypass	912 0420 00
C47	CAPACITOR: variable; 7 max to min mmf; 500 vdcw; ceramic	V8 & V9 plate tank trimmer	917 1013 00
C48	CAPACITOR: fixed; 100 mmf p/m 5%; 500 vdcw; ceramic	V10 input coupling	916 4059 00
C49	CAPACITOR: fixed; 100 mmf p/m 5%; 500 vdcw; ceramic	V10 input coupling	916 4059 00
C50	CAPACITOR: fixed; 470 mmf p/m 20%; 500 vdcw; mica	V10 cathode bypass	935 0135 00
C51	CAPACITOR: fixed; 20 mf; 150 vdcw; dry electrolytic polarized	V10 cathode bypass	184 6509 00
C52	CAPACITOR: fixed; 1000 mmf p/m 20%; 5000 vdcw; ceramic	V10 plate decoupling	913 0101 00
C53	NOT USED		
C54	CAPACITOR: variable; 12 max to 5 min mmf; 500 vdcw; ceramic	Antenna trimmer	917 9010 00
C55	CAPACITOR: fixed; 5 mmf p/m 10%; 500 vdcw; ceramic	Sidetone & antenna meter coupling	916 4386 00
C56	CAPACITOR: fixed; 100 mmf p/m 10%; 500 vdcw; mica	Antenna meter filter	935 0106 00
C57	CAPACITOR: fixed; 1.0 mf p/m 10%; 600 vdcw; paper	High voltage filter	930 0080 00
C58	CAPACITOR: fixed; 0.01 mf p/m 20%; 300 vdcw; mica	Sidetone coupling	935 2118 00
C59	NOT USED		
C60	NOT USED		

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
C61	CAPACITOR: fixed 20 mf; 150 vdcw; dry electrolytic	V11	184 6509 00
C62	CAPACITOR: fixed; 20 mf; 150 vdcw; dry electrolytic	Mike voltage bypass	184 6509 00
C63	CAPACITOR: fixed; 20 mf; 150 vdcw; dry electrolytic	V12 & V13 cathode bypass	184 6509 00
C64	CAPACITOR: fixed; 0.1 mf p/m 10%; 600 vdcw; paper	V12 & V13 screen bypass	961 4114 00
C65	CAPACITOR: fixed; 4700 mmf p/m 20%; 500 vdcw; mica	T4 RF bypass	935 2104 00
C66	CAPACITOR: fixed; 470 mmf p/m 20%; 500 vdcw; mica	M1 filter	935 0135 00
C67	CAPACITOR: fixed; 0.25 mf p/m 10%; 600 vdcw; paper	V11 (sidetone) plate decoupling	961 4129 00
C68	CAPACITOR: fixed; 2 mf plus 40% minus 15%; 600 vdcw; paper	Receiver B+ filter	930 0023 00
C69	CAPACITOR: fixed; 2 mf plus 40% minus 15%; 600 vdcw; paper	Receiver B+ filter	930 0023 00
C70	CAPACITOR: fixed; 20 mf; 150 vdcw; dry electrolytic	V11 (sidetone) cathode bypass	184 6509 00
C71	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V6 & V7 cathode bypass	912 0420 00
C72	CAPACITOR: fixed; 500 mmf p/m 20%; 500 vdcw; oil impregnated silver mica	V8 & V9 cathode bypass	912 0420 00
C73	CAPACITOR: fixed; 0.2 mf p/m 20%; 120 wv	Motor noise suppressor	931 0151 00
CR1	CRYSTAL DIODE: germanium; Type 1N63	Sidetone rectifier	353 0029 00
D1	DYNAMOTOR: Aircraft Radio; input 27 vdc; output 360 vdc at 135 ma load continuous duty, 310 vdc at 355 ma load intermittent duty	High voltage supply	231 0032 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
E1	TERMINAL STRIP: Barrier type; phenolic; 5 terminal	Dynamotor terminal board	367 0137 00
E2	TERMINAL STRIP: split lug type; phenolic, 4 terminal	Autopositioner motor terminal board	504 4096 002
E3	RING ASSEMBLY - tuning; silver plated copper ring with phenolic insert		561 0051 002
E4	CORE - tuning - powdered iron		288 1064 00
H1	POST - spacing; aluminum, 1/4 hex X 0.668 long.		503 4921 001
H2	POST - spacing; same as H1		
H3	POST - spacing; same as H1		
H4	POST - spacing; aluminum, 3/16 Hex X 0.328 long.		503 4922 001
H5	POST - spacing; same as H4		
H6	POST - spacing; same as H4		
H7	POST - spacing; same as H4		
H8	POST - spacing; same as H1		
H9	POST - spacing; same as H1		
H10	POST - spacing; same as H1		
H11	STOP - handle		503 4943 001
H12	STOP - handle; same as H11		
H13	SPACER - motor mounting		561 0066 001
H14	SPACER - clutch		502 1164 002
H15	NUT Hex; 5/16-24, NF-2, steel		334 0249 00
H16	RING - retaining; for .250 shaft		340 0025 00
H17	RING - retaining; same as H16		
H18	RING - retaining; for .125 shaft		340 0087 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
H19	RING - retaining; same as H18		
H20	RING - retaining; for .187 shaft		340 0090 00
H21	WASHER - thrust		504 3975 001
H22	WASHER - thrust. Same as H21		
H23	RING - retaining. Same as H20		
H24	NUT - square, 4-40, NC-2, steel		334 0485 00
H25	WASHER - lock; No. 4 split		310 3340 00
H26	SCREW - cap; socket head, 4-40 x 1/2		324 0300 00
H27	PIN - grooved; 1/16 x 3/8, stainless steel		311 1122 00
H28	SCREW - special; tuning core adjusting		561 0030 001
H29	NUT - special		561 0031 001
J1	CONNECTOR, receptacle; female contact	Transmit antenna jack	357 9003 00
J2	CONNECTOR, receptacle; female contact	Receive antenna jack	357 9003 00
K1	RELAY: circuit control; contact combination left 1C; 26.5 vdc; 700 ohm p/m 10%	Antenna relay	972 1169 00
K2	RELAY: keying; contact combination 1C; 26.5 vdc; 785 ohm p/m 10%	Autopositioner Interlock relay	972 1013 00
K3	RELAY: starting; one pole normally open; double break 26.5 vdc; 425 ohm p/m 10%	Dynamotor relay	972 1012 00
K4	RELAY: circuit control; contact combination right 1C, left 1C; 26.5 vdc; 200 ohm p/m 10%	Power audio relay	972 1168 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
K5	NOT USED		
K6	RELAY: Autopositioner contact	MC auto position	503 5115 003
K7	RELAY: Autopositioner contact	Tenth mc auto position	503 5115 003
L1	INDUCTOR: RF choke 500 uh	V1 cathode choke	240 0073 00
L2	INDUCTOR: RF tank coil	V1 plate tank	504 4107 002
L3	INDUCTOR: RF tank coil	V2 grid tank	504 4107 002
L4	INDUCTOR: RF tank coil	V2 plate tank	504 4109 002
L5	INDUCTOR: RF choke 500 uh	V3 cathode choke	240 0073 00
L6	INDUCTOR: RF choke 3.8 uh	Z1 to V6 coupling choke	240 0032 00
L7	INDUCTOR: RF choke 3.8 uh	Z1 to V7 coupling choke	240 0032 00
L8	INDUCTOR: RF choke 3.8 uh	V4 & V5 plate choke	240 0032 00
L9	INDUCTOR: RF tank coil; Collins part dwg 504 4109 002	V4 & V5 plate tank	504 4109 002
L10	INDUCTOR: coupling link	V4 & V5 to V6 & V7 coupling	504 4029 001
L11	INDUCTOR: coupling link	V4 & V5 to V6 & V7 coupling	504 4030 001
L12	INDUCTOR: RF tank coil	V6 & V7 grid tank	561 0012 001
L13	INDUCTOR: RF choke 0.47 uh	V6 & V7 plate choke	240 0060 00
L14	INDUCTOR: RF tank coil	V6 & V7 plate tank	561 0017 00
L15	INDUCTOR: RF choke 0.47 uh	V8 & V9 plate choke	240 0060 00
L16	INDUCTOR: RF tank coil	V8 & V9 plate tank	561 0020 001
L17	INDUCTOR: RF choke	V10 plate choke	240 0012 00
L18	INDUCTOR: RF tank coil	V10 plate tank	561 0025 001
L19	INDUCTOR: RF coupling link	Output coupling link	561 0026 001

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
L20	NOT USED		
L21	INDUCTOR: RF choke	Supply voltage filter	504 5125 002
L22	NOT USED		
L23	INDUCTOR: RF choke 3.8 uh	V2 plate choke	240 0032 00
M1	METER: DC Milliammeter; Permanent magnet, moving coil; meter resistance, 25 ohm p/m 10%; range 0-1 ma DC; accuracy p/m 2%	Indicating meter	458 0208 00
N1	FLANGE - tenth megacycle; markings 0.0 through 0.9		504 4073 002
N2	FLANGE - megacycle; markings 118 through 135		504 4072 002
01	BEARING - sleeve; porous bronze, 0.250 ID		309 0116 00
02	BEARING - sleeve; same as 01		
03	BEARING - sleeve; porous bronze, 0.125 ID		309 0115 00
04	BEARING - sleeve; same as 03		
05	BEARING - sleeve; same as 03		
06	BEARING - sleeve; same as 03		
07	AUTOPOSITIONER ASSEMBLY - tenth megacycle, complete; consists of shaft assembly 08, ring H18, pawl 09, plate assembly A5, flange N1, drum 023, flange 024, spacer H14, nut H15, ring H16, clutch assembly 025, spring 026, spring 027, gear 028 and ring H17		504 4134 003
08	SHAFT ASSEMBLY - tenth megacycle; consists of shaft and 12-position stop wheel		504 4088 002
09	PAWL - autopositioner		503 5079 002

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
010	BEARING - sleeve; porous bronze, 0.375 ID		309 0117 00
011	STUD - pawl pivot		503 4918 001
012	AUTOPOSITIONER ASSEMBLY - megacycle, complete; consists of shaft assembly 013, ring H19, pawl 014, plate assembly A6, flange N2, drum 023, flange 024, spacer H14, nut H15, ring H16, clutch assembly 025, spring 026, spring 027, gear 028 and ring H17		504 4133 003
013	SHAFT ASSEMBLY - megacycle; consists of shaft and 20 position stopwheel.		504 4087 002
014	PAWL - autopositioner; same as 09		
015	BEARING - sleeve; same as 010		
016	STUD - pawl pivot; same as 011		
017	BEARING - sleeve; same as 03		
018	BEARING - sleeve; same as 03		
019	BEARING - sleeve; porous bronze		504 9371 001
020	GEAR ASSEMBLY - idler; consists of gear and shaft		503 7085 001
021	GEAR ASSEMBLY - drive; consists of gear and pinion		503 7087 001
022	GEAR ASSEMBLY - drive; consists of gear and pinion		504 9372 001
023	DRUM - clutch		502 1132 002
024	FLANGE - clutch		503 4920 001
025	CLUTCH ASSEMBLY; consists of clutch shoe and lining		502 1825 002
026	SPRING - clutch		502 7029 002

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
027	SPRING - clutch; same as 026		
028	GEAR ASSEMBLY - clutch; consists of clutch gear, bearing and spacer		503 7091 002
029	PLATE ASSEMBLY - switch mounting; includes right angle drive gears, shafts, bearings and associated hardware		561 0041 002
030	SHAFT ASSEMBLY - flexible; consists of flexible shaft and end fittings		127 0042 00
031	SHAFT ASSEMBLY - soldered; consists of shaft and end fitting		504 4058 002
032	GEAR - spur; with hub		504 4059 002
033	GEAR - spur; with split hub		504 4060 002
034	CLAMP - collet; 0.312 diameter hole		504 7537 002
035	BEARING - shaft support		504 3979 001
036	SHAFT ASSEMBLY - driven; consists of shaft assembly 031, gear 032, pin H27, bearing 035, rings H20 and H23, washers H21 and H22		504 4093 002
037	HUB - coupler		503 4997 001
038	GUIDE - coupler		503 5005 001
039	HUB - coupler; clamp type		504 4066 002
040	BEARING - sleeve;		504 3983 001
041	CAM ASSEMBLY - front; consists of cam and hub		504 4075 002
042	CAM ASSEMBLY - rear; consists of cam and hub		504 4074 002
043	BEARING - sleeve; same as 040		

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
044	SPRING - tuning table		561 0029 002
045	SHAFT ASSEMBLY - tuning. Consists of shafts, cam assemblies 041, 042, clamps 034, helical gears, plate assembly and associated hardware.		561 0036 002
P1	CONNECTOR: Pin insert (Plug) aluminum with phenolic insulation; 32 contacts (28 contact 10 amp size; 4 contacts 40 amp size)	Remote control	370 2042 00
R1	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	V1 grid leak	745 1170 00
R2	RESISTOR: fixed; 560 ohm p/m 10% 17 RCWV, 1/2 w; composition	V1 cathode	745 1076 00
R3	RESISTOR: fixed; 27,000 ohm p/m 10%; 116 RCWV, 1/2 w; composition	V1 screen dropping	745 1146 00
R4	RESISTOR: fixed; 2200 ohm p/m 10% 33 RCWV, 1/2 w; composition	V1 B+ drop	745 1100 00
R5	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	V2 grid leak	745 1170 00
R6	RESISTOR: fixed; 220 ohm p/m 10%; 10 RCWV, 1/2 w; composition	V2 cathode	745 1058 00
R7	RESISTOR: fixed; 27,000 ohm p/m 10%; 116 RCWV, 1/2 w; composition	V2 screen drop	745 1146 00
R8	RESISTOR: fixed; 2200 ohm p/m 10%; 33 RCWV, 1/2 w; composition	V2 B+ drop	745 1100 00
R9	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	V3 grid leak	745 1170 00
R10	RESISTOR: fixed; 560 ohm p/m 10%; 17 RCWV, 1/2 w; composition	V3 cathode	745 1076 00
R11	RESISTOR: fixed; 27,000 ohm p/m 10%; 116 RCWV, 1/2 w; composition	V3 screen drop	745 1146 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
R12	NOT USED		
R13	RESISTOR: fixed; 2200 ohm p/m 10%; 33 RCWV, 1/2 w; composition	V3 B+ drop	745 1100 00
R14	NOT USED		
R15	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	V4 grid leak	745 1170 00
R16	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	V5 grid leak	745 1170 00
R17	RESISTOR: fixed; 150 ohm p/m 10%; 8.7 RCWV, 1/2 w; composition	V4 & V5 grid metering	745 1051 00
R18	RESISTOR: fixed; 100 ohm p/m 10%; 7.1 RCWV, 1/2 w; composition	V4 & V5 cathode	745 1044 00
R19	RESISTOR: fixed; 15,000 ohm p/m 10%; 87 RCWV, 1/2 w; composition	V4 & V5 screen dropping	745 1135 00
R20	RESISTOR: fixed; 2700 ohm p/m 10%; 52 RCWV, 1 w; composition	V4 & V5 B+ dropping	745 3104 00
R21	RESISTOR: fixed; 22,000 ohm p/m 10%; 105 RCWV, 1/2 w; composition	V6 grid leak	745 1142 00
R22	RESISTOR: fixed; 22,000 ohm p/m 10%; 105 RCWV, 1/2 w; composition	V7 grid leak	745 1142 00
R23	RESISTOR: fixed; 100 ohm p/m 10%; 7.1 RCWV, 1/2 w; composition	V6 & V7 cathode	745 1044 00
R24	RESISTOR: fixed; 8200 ohm p/m 10%; 64 RCWV, 1/2 w; composition	V6 & V7 screen dropping	745 1125 00
R25	RESISTOR: fixed; 1200 ohm p/m 10%; 35 RCWV, 1 w; composition	V6 & V7 B+ dropping	745 3090 00
R26	RESISTOR: fixed; 10,000 ohm p/m 10%; 71 RCWV, 1/2 w; composition	V8 grid leak	745 1128 00
R27	RESISTOR: fixed; 10,000 ohm p/m 10%; 71 RCWV, 1/2 w; composition	V9 grid leak	745 1128 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
R28	RESISTOR: fixed; 68 ohm p/m 10%; 5.8 RCWV, 1/2 w; composition	V8 & V9 grid metering	745 1037 00
R29	RESISTOR: fixed; 62 ohm p/m 5%; 7.9 RCWV, 1 w; composition	V8 & V9 cathode	745 3035 00
R30	RESISTOR: fixed; 1000 p/m 10%; 22 RCWV, 1/2 w; composition	V8 & V9 screen dropping	745 1086 00
R31	RESISTOR: fixed; 1000 ohm p/m 5%; 25 w; wire wound	V8 & V9 B+ dropping	710 3141 00
R32	RESISTOR: fixed; 12,000 ohm p/m 10%; 105 RCWV, 1/2 w; composition	V10 grid leak	745 1132 00
R33	RESISTOR: fixed; 12,000 ohm p/m 10%; 105 RCWV, 1/2 w; composition	V10 grid leak	745 1132 00
R34	RESISTOR: fixed; 10 ohm p/m 10%; 2.2 RCWV, 1/2 w; composition	V10 grid metering	745 1002 00
R35	RESISTOR: fixed; 47,000 ohm p/m 10%; 153 RCWV, 1/2 w; composition	V10 cathode metering	745 1156 00
R36	RESISTOR: fixed 200 ohm p/m 10%; 10 w; wire wound	V10 cathode	710 1200 20
R37	RESISTOR: fixed; 33,000 ohm p/m 10%; 257 RCWV, 2 w; composition	V10 screen dropping	745 5149 00
R38	RESISTOR: fixed; 1000 ohm p/m 10%; 22 RCWV, 1/2 w; composition	Antenna metering filter	745 1086 00
R39	RESISTOR: fixed; 2500 ohm p/m 10%; 250 volts max, 100 ma max, 25 w; wire wound	V1, V2, V3, V4, V5, V6, V7 B+ dropping	710 0066 00
R40	RESISTOR: fixed; 150 ohm p/m 10% 61 volts max, 410 ma max, 25 w; wire wound	V1, V2, V3, V4, V5, V6, V7, V8, V9, V11, V12, V13 B+ dropping	710 3150 20
R41	RESISTOR: variable; 100,000 ohm p/m 20% max; 1/2 w min; composition	Sidetone amplifier grid leak	376 3260 00
R42	RESISTOR: fixed; 820 ohm p/m 10%; 20 RCWV, 1/2 w; composition	V11 (Sidetone) cathode	745 1083 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
R43	NOT USED		
R44	RESISTOR: fixed; 1000 ohm p/m 10%; 22 RCWV, 1/2 w; composition	V11 (audio amplifier) cathode	745 1086 00
R45	NOT USED		
R46	NOT USED		
R47	RESISTOR: fixed; 680 ohm p/m 10%; 87 RCWV, 2 w; composition	Microphone voltage dropping	745 5079 00
R48	RESISTOR: fixed; 47,000 ohm p/m 10%; 153 RCWV, 1/2 w; composition	V12 & V13 grid leak	745 1156 00
R49	RESISTOR: fixed; 680 ohm p/m 10%; 37 RCWV, 2 w; composition	V12 & V13 cathode	745 5079 00
R50	RESISTOR: fixed; 680 ohm p/m 10%; 37 RCWV, 2 w; composition	V12 & V13 cathode	745 5079 00
R51	RESISTOR: fixed; 3300 ohm p/m 10%; 57 RCWV, 1 w; composition	V12 & V13 screen dropping	745 3107 00
R52	RESISTOR: fixed; 56,000 ohm p/m 5% 167 RCWV, 1/2 w; composition	Battery voltage metering	745 1159 00
R53	RESISTOR: fixed; 10,000 ohm p/m 10%; 71 RCWV, 1/2 w; composition	Antenna metering dropping	745 1128 00
R54	RESISTOR: fixed; 22 ohm p/m 10%; 3.3 RCWV, 1/2 w; composition	Antenna metering shunt	745 1016 00
R55	RESISTOR: fixed; 2.5 ohm p/m 5%; 8 w; wire wound	Filament dropping	747 0056 00
R56	RESISTOR: fixed; 1.6 ohm p/m 5%; 8 w; wire wound	Filament dropping	747 0054 00
R57	RESISTOR: fixed; 2.5 ohm p/m 5%; 8 w; wire wound	Filament dropping	747 0056 00
R58	RESISTOR: fixed; 1.6 ohm p/m 5%; 8 w; wire wound	Filament dropping	747 0054 00
R59	RESISTOR: fixed; 35 ohm p/m 10%; 8 w; wire wound	Filament dropping	747 0108 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
R60	RESISTOR: fixed; 120 ohm p/m 10%; 10 w; wire wound	Filament dropping	710 0194 00
R61	RESISTOR: fixed; 10,000 ohm p/m 10%; 25 w; wire wound	Receiver B+ bleeder	710 3104 20
R62	RESISTOR: fixed; 2000 ohm p/m 10%; 25 w; wire wound	Receiver B+ dropping	710 3242 00
R63	RESISTOR: fixed; 6800 ohm p/m 10%; 117 RCWV, 2 w; composition	V11 plate dropping	745 5121 00
R64	NOT USED		
R65	RESISTOR: fixed; 680 ohm p/m 10%; 37 RCWV, 2 w; composition	V12 & V13 cathode	745 5079 00
R66	RESISTOR: fixed; 33,000 ohm p/m 10%; 257 RCWV, 2 w; composition	V10 screen dropping	745 5149 00
R67	RESISTOR: fixed; 120,000 ohm p/m 10%; 245 RCWV, 1/2 w; composition	Grid circuit voltage divider	745 1174 00
R68	RESISTOR: fixed; 120,000 ohm p/m 10%; 245 RCWV, 1/2 w; composition	Grid circuit voltage divider	745 1174 00
R69	RESISTOR: fixed; 100,000 ohm p/m 10%; 224 RCWV, 1/2 w; composition	Grid circuit voltage divider	745 1170 00
R70	RESISTOR: fixed; 10 ohm p/m 10%; 2.2 RCWV, 1/2 w; composition	V10 grid metering	745 1002 00
S1	SWITCH: rotary; 20 position phenolic bakelite; spring silver alloy clips; coin silver alloy rotor blades	MC crystal selector	269 1085 00
S2	SWITCH: rotary wafer; 12 position phenolic bakelite; spring silver alloy clips; non-shorting; coin silver alloy blades	Tenth mc crystal selector	269 1257 00
S3	SWITCH: rotary; 2 pole, 6 position non-shorting type, brass; silver plated contacts	Meter selector	259 1042 00
S4	SWITCH: rotary; 20 position phenolic bakelite; spring silver alloy clips; coin silver alloy blades	MC autopositioner	269 1261 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
S5	SWITCH: rotary wafer; 12 position; phenolic bakelite; spring silver alloy clips; shorting type, coin silver alloy blades	Tenth mc autopositioner	269 1253 00
T1	TRANSFORMER: audio input; primary leads 1 & 2, 82 ohm; secondary leads 3 & 4 100,000 ohm. 700 w	Microphone transformer	677 0395 00
T2	TRANSFORMER: audio output; primary leads 1 & 2, 20,000 ohm; secondary leads 3 & 4, 500 ohm, 300 mw	Audio transformer	677 0198 00
T3	TRANSFORMER: Input; leads 1 & 2, 50 ohm; leads 3 & G, 1000 ohm, leads 5 & 7, 75,000 ohm, 6 CT	Interstage transformer	677 0304 00
T4	TRANSFORMER: modulation; hermetically sealed; leads 1 & 3, 8450 ohm; leads 4 & 5, 4000 ohm, lead 2 Ct, 20 w	Modulation transformer	677 0317 00
V1	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	F1 oscillator and quadrupler	253 0001 00
V2	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	4 F1 tripler	253 0001 00
V3	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio Frequency amplifier pentode	F2 oscillator and tripler	253 0001 00
V4	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	Push pull (with V5) 12 F1 amplifier	253 0001 00
V5	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	Push pull (with V4) 12 F1 amplifier	253 0001 00
V6	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	12 F1 plus 3 F2 balanced mixer (with V7)	253 0001 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
V7	VACUUM TUBE: ARINC Type No. 5654; similar commercial type No. 6AK5; Radio frequency amplifier pentode	12 F1 plus 3 F2 balanced mixer (with V6)	253 0001 00
V8	VACUUM TUBE: Type 6AR5; Radio frequency amplifier pentode	Push pull driver (with V9)	255 0211 00
V9	VACUUM TUBE: Type 6AR5; Radio frequency amplifier pentode	Push pull driver (with V8)	255 0211 00
V10	VACUUM TUBE: Transmitting type, 832A beam push pull Radio frequency power amplifier	Final push pull power amplifier	256 0066 00
V11	VACUUM TUBE: Type 12AU7 twin triode	Sidetone amplifier (one half) and audio amplifier (one half)	255 0199 00
V12	VACUUM TUBE: Type 6V6GT: Beam power pentode	Push pull modulator amplifier (with V13)	255 0021 00
V13	VACUUM TUBE: Type 6V6GT: Beam power pentode	Push pull modulator amplifier (with V12)	255 0021 00
XV1	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V1 socket	220 1034 00
XV2	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V2 socket	220 1034 00
XV3	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V3 socket	220 1034 00
XV4	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V4 socket	220 1034 00
XV5	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V5 socket	220 1034 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
XV6	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V6 socket	220 1034 00
XV7	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V7 socket	220 1034 00
XV8	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze; cadmium plated contacts	V8 socket	220 1034 00
XV9	TUBE SOCKET: 7 pin; miniature shielded; mica filled phenolic; phosphor bronze, cadmium plated contacts	V9 socket	220 1034 00
XV10	TUBE SOCKET: For type 832 A; glazed ceramic body; phosphor bronze clips with silver plated beryllium copper springs	V10 socket	220 1072 00
XV11	TUBE SOCKET: 9 pin; miniature shielded; mica filled phenolic; beryllium copper, silver plated contacts	V11 socket	220 1063 00
XV12	TUBE SOCKET: Octal; low loss mica filled bakelite; phosphor bronze, silver plated contacts	V12 socket	220 1005 00
XV13	TUBE SOCKET: Octal; low loss mica filled bakelite; phosphor bronze; silver plated contacts	V13 socket	220 1005 00
Y1	CRYSTAL UNIT: CR-18/U style; frequency 7500.00 kc	Frequency generation	291 6750 00
Y2•	CRYSTAL UNIT: CR-18/U style; frequency 7583.33 kc	Frequency generation	291 6751 00
Y3	CRYSTAL UNIT: CR-18/U style; frequency 7666.67 kc	Frequency generation	291 6752 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
Y4	CRYSTAL UNIT: CR-18/U style; frequency 7750.00 kc	Frequency generation	291 6753 00
Y5	CRYSTAL UNIT: CR-18/U style; frequency 7833.33 kc	Frequency generation	291 6754 00
Y6	CRYSTAL UNIT: CR-18/U style; frequency 7916.67 kc	Frequency generation	291 6755 00
Y7	CRYSTAL UNIT: CR-18/U style; frequency 8000.00 kc	Frequency generation	291 6756 00
Y8	CRYSTAL UNIT: CR-18/U style; frequency 8083.33 kc	Frequency generation	291 6757 00
Y9	CRYSTAL UNIT: CR-18/U style; frequency 8166.67 kc	Frequency generation	291 6758 00
Y10	CRYSTAL UNIT: CR-18/U style; frequency 8250.00 kc	Frequency generation	291 6759 00
Y11	CRYSTAL UNIT: CR-18/U style; frequency 8333.33 kc	Frequency generation	291 6760 00
Y12	CRYSTAL UNIT: CR-18/U style; frequency 8416.67 kc	Frequency generation	291 6761 00
Y13	CRYSTAL UNIT: CR-18/U style; frequency 8500.00 kc	Frequency generation	291 6762 00
Y14	CRYSTAL UNIT: CR-18/U style; frequency 8583.33 kc	Frequency generation	291 6763 00
Y15	CRYSTAL UNIT: CR-18/U style; frequency 8666.67 kc	Frequency generation	291 6764 00
Y16	CRYSTAL UNIT: CR-18/U style; frequency 8750.00 kc	Frequency generation	291 6765 00
Y17	CRYSTAL UNIT: CR-18/U style; frequency 8833.33 kc	Frequency generation	291 6766 00
Y18	CRYSTAL UNIT: CR-18/U style; frequency 8916.67 kc	Frequency generation	291 6767 00
Y19	CRYSTAL UNIT: CR-18/U style; frequency 9333.33 kc	Frequency generation	291 6768 00

TYPE 17L-3 VHF TRANSMITTER

CIRCUIT SYMBOL	NAME AND DESCRIPTION OF COMPONENT	CIRCUIT FUNCTION	COLLINS PART NO.
Y20	CRYSTAL UNIT: CR-18/U style; frequency 9366.67 kc	Frequency generation	291 6769 00
Y21	CRYSTAL UNIT: CR-18/U style; frequency 9400.00 kc	Frequency generation	291 6770 00
Y22	CRYSTAL UNIT: CR-18/U style; frequency 9433.33 kc	Frequency generation	291 6771 00
Y23	CRYSTAL UNIT: CR-18/U style; frequency 9466.67 kc	Frequency generation	291 6772 00
Y24	CRYSTAL UNIT: CR-18/U style; frequency 9500.00 kc	Frequency generation	291 6773 00
Y25	CRYSTAL UNIT: CR-18/U style; frequency 9533.33 kc	Frequency generation	291 6774 00
Y26	CRYSTAL UNIT: CR-18/U style; frequency 9566.67 kc	Frequency generation	291 6775 00
Y27	CRYSTAL UNIT: CR-18/U style; frequency 9600.00 kc	Frequency generation	291 6776 00
Y28	CRYSTAL UNIT: CR-18/U style; frequency 9633.33 kc	Frequency generation	291 6777 00
Z1	TRANSFORMER: Bandpass type; 28.0 to 28.9 mc	V3 load, F2 tripler, and V3 to V7 coupling	504 4046 002

314Y-1 REMOTE CONTROL UNIT

CIRCUIT SYMBOL	NAME AND DESCRIPTION	CIRCUIT FUNCTION	COLLINS PART NO.
I101	BULB: 3 v. DC, 0.19 amps	Panel lamp	262 0064 00
S103	SWITCH: toggle, SPST - 3.0 amps at 250 volts AC or DC	MCW receive to MCW Trans.	260 0895 00
S101A	SWITCH: Phenolic wafer	Megacycle auxiliary control	269 1275 00
S101B	SWITCH: Phenolic wafer	Megacycle control	269 1274 00
S102	SWITCH: Phenolic wafer	Tenth Mc. control	269 1076 00

314U-4 REMOTE CONTROL UNIT

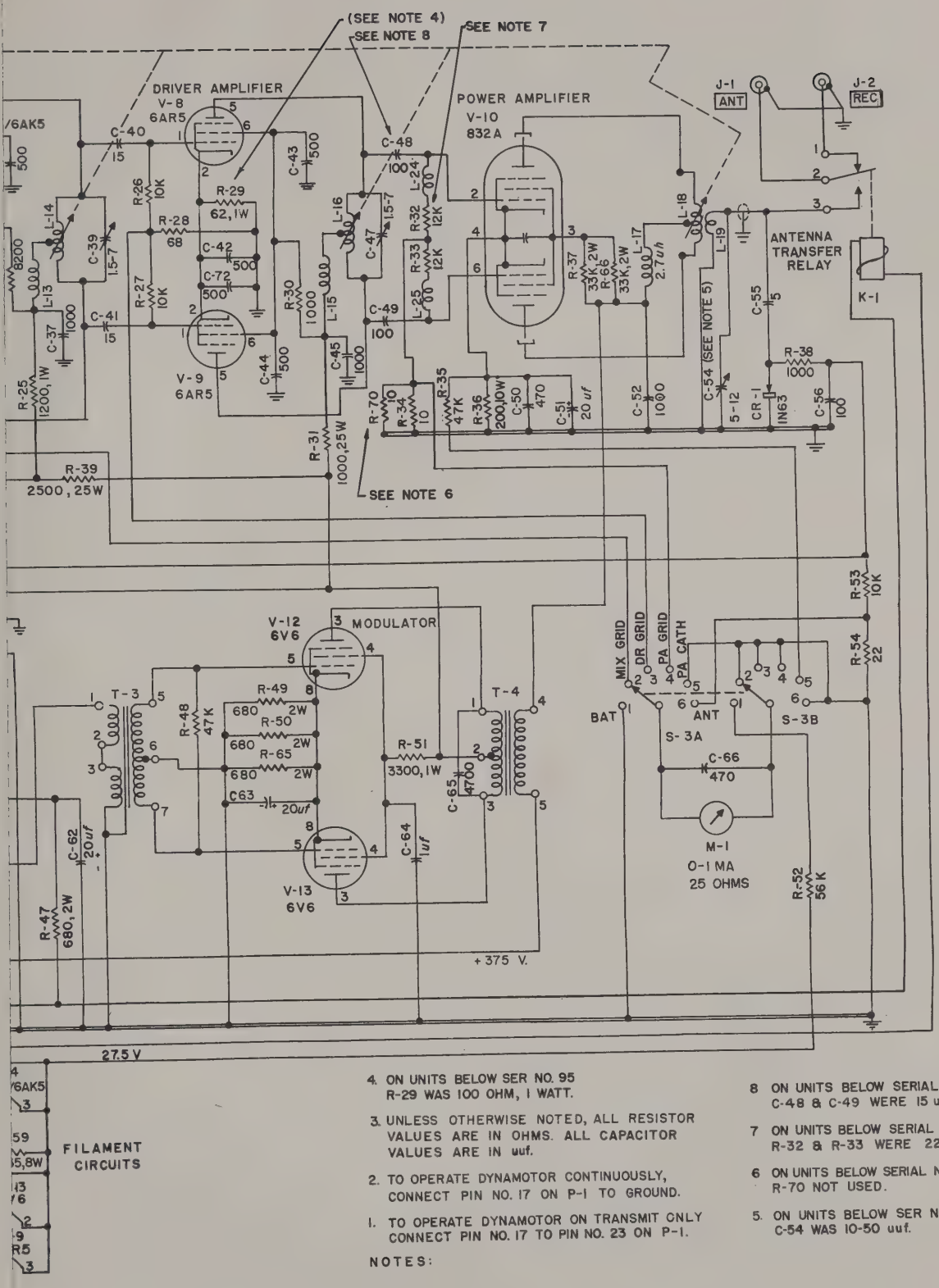
CIRCUIT SYMBOL	NAME AND DESCRIPTION	CIRCUIT FUNCTION	COLLINS PART NO.
I201	BULB: 3 v DC; .19 amps	Panel lamp	262 0064 00
S203	SWITCH: Toggle SPST - 3.0 amps at 250 volts AC or DC	90/150 phase sw.	260 0701 00
S201A	SWITCH: Phenolic wafer	51R Mc control	269 1073 00
S201B	SWITCH: Phenolic wafer	51R Mc. Auxiliary control	269 1275 00
S201C	SWITCH: Phenolic wafer	17L-3 Mc. control	269 1274 00
S202A	SWITCH: Phenolic wafer	51R Tenth Mc. control	269 1076 00
S202B	SWITCH: Phenolic wafer	17L-3 Tenth Mc control	269 1076 00

68U-1 COAXIAL RELAY

CIRCUIT SYMBOL	NAME AND DESCRIPTION	CIRCUIT FUNCTION	COLLINS PART NO.
None	RELAY: 28 v DC SPDT	Antenna transfer	410 0045 00
J-1	RECEPTACLE: Coaxial type N	N.O. to 17L-3 Rec. connector	357 9003 00
J-4	RECEPTACLE: 2 pin type AN	Relay 28 v power connector	357 3010 00
P-1, P-2, P-3	PLUG: Coaxial, type N	Connecting cables to relay	357 9001 00
P-4	PLUG: 2 pin type AN	28 v power cable to relay	357 4009 00
None	CLAMP: Cable	For 2 pin connector type AN	357 8001 00

17L-3 SHOCKMOUNT ASS'Y

CIRCUIT SYMBOL	NAME AND DESCRIPTION	CIRCUIT FUNCTION	COLLINS PART NO.
	CONNECTOR: 32 contact	Shockmount connector to 17L-3	370 2017 00
	ISOLATOR: Shockmount, 10 lb.	Right front and right rear corners	200 0158 00
	ISOLATOR: Shockmount, 12 lb.	Left front and left rear corners	200 0159 000
	17L-3 & 51R SHOCKMOUNT ASS'Y		
	CONNECTOR: 32 contact	Shockmount connector to 17L-3	370 2017 00
	CONNECTOR: 45 contact	Shockmount connector to 51R	370 2034 00
	ISOLATOR: Shockmount 20 lb.	All four corners	200 0160 00



4. ON UNITS BELOW SER NO. 95 R-29 WAS 100 OHM, 1 WATT.

3. UNLESS OTHERWISE NOTED, ALL RESISTOR VALUES ARE IN OHMS. ALL CAPACITOR VALUES ARE IN uuf.

2. TO OPERATE DYNAMOTOR CONTINUOUSLY, CONNECT PIN NO. 17 ON P-1 TO GROUND.

1. TO OPERATE DYNAMOTOR ON TRANSMIT ONLY CONNECT PIN NO. 17 TO PIN NO. 23 ON P-1.

NOTES:

8 ON UNITS BELOW SERIAL NO. 215 C-48 & C-49 WERE 15 uuf.

7 ON UNITS BELOW SERIAL NO. 215 R-32 & R-33 WERE 22K.

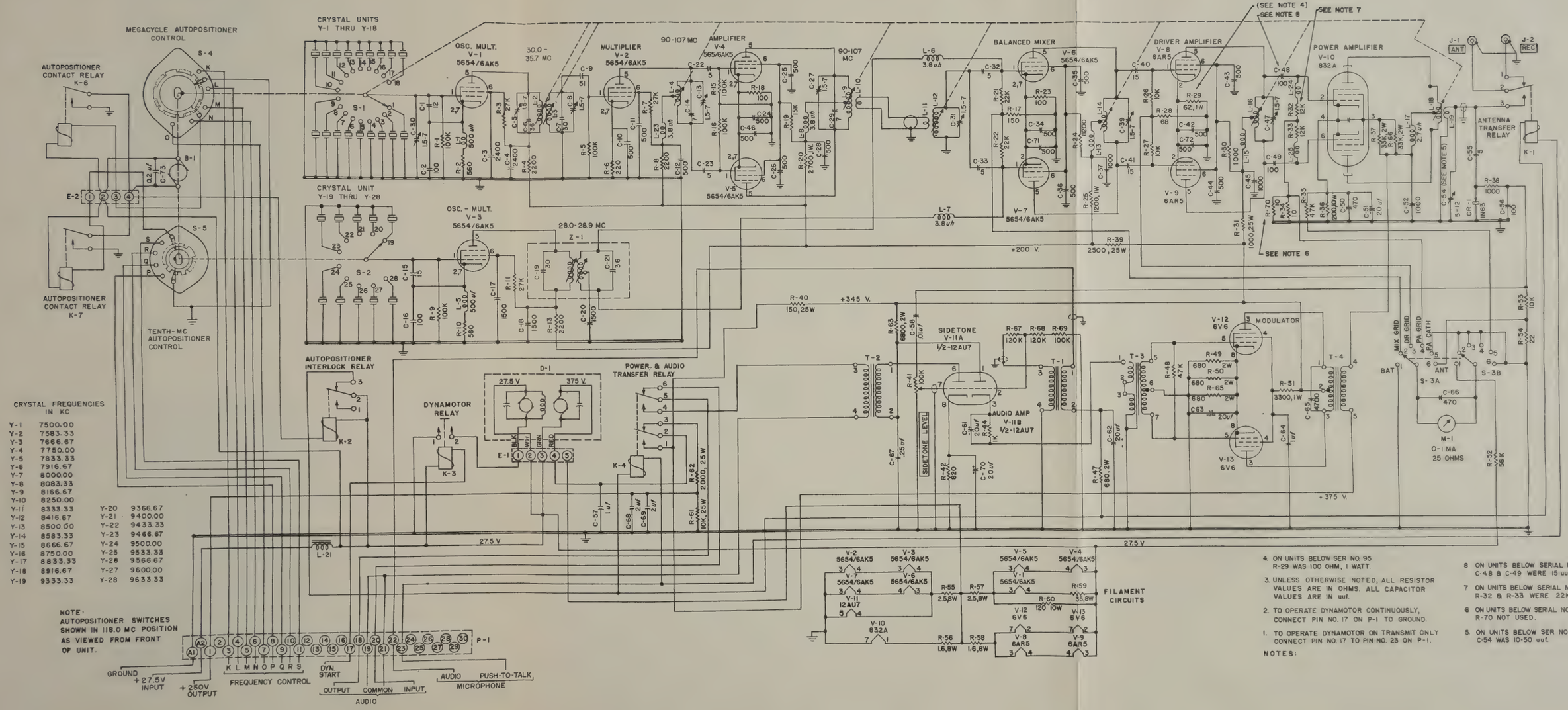
6 ON UNITS BELOW SERIAL NO. 215 R-70 NOT USED.

5. ON UNITS BELOW SER NO. 200 C-54 WAS 10-50 uuf.

Figure 7-1 17L-3 VHF Transmitter Schematic Diagram

17L-3 SHOCKMOUNT ASS'Y

CIRCUIT SYMBOL	NAME AND DESCRIPTION	CIRCUIT FUNCTION	COLLINS PART NO.
	CONNECTOR: 32 contact	Shockmount connector to 17L-3	370 2017 00
	ISOLATOR: Shockmount, 10 lb.	Right front and right rear corners	200 0158 00
	ISOLATOR: Shockmount, 12 lb.	Left front and left rear corners	200 0159 000
	17L-3 & 51R SHOCKMOUNT ASS'Y		
	CONNECTOR: 32 contact	Shockmount connector to 17L-3	370 2017 00
	CONNECTOR: 45 contact	Shockmount connector to 51R	370 2034 00
	ISOLATOR: Shockmount 20 lb.	All four corners	200 0160 00



CRYSTAL FREQUENCIES IN KC

Y-1	7500.00		
Y-2	7583.33		
Y-3	7666.67		
Y-4	7750.00		
Y-5	7833.33		
Y-6	7916.67		
Y-7	8000.00		
Y-8	8083.33		
Y-9	8166.67		
Y-10	8250.00		
Y-11	8333.33	Y-20	9366.67
Y-12	8416.67	Y-21	9400.00
Y-13	8500.00	Y-22	9433.33
Y-14	8583.33	Y-23	9466.67
Y-15	8666.67	Y-24	9500.00
Y-16	8750.00	Y-25	9533.33
Y-17	8833.33	Y-26	9566.67
Y-18	8916.67	Y-27	9600.00
Y-19	9333.33	Y-28	9633.33

NOTE: AUTOPOSITIONER SWITCHES SHOWN IN 118.0 MC POSITION AS VIEWED FROM FRONT OF UNIT.

NOTES:

1. TO OPERATE DYNAMOTOR ON TRANSMIT ONLY CONNECT PIN NO. 17 TO PIN NO. 23 ON P-1.
2. TO OPERATE DYNAMOTOR CONTINUOUSLY, CONNECT PIN NO. 17 ON P-1 TO GROUND.
3. UNLESS OTHERWISE NOTED, ALL RESISTOR VALUES ARE IN OHMS. ALL CAPACITOR VALUES ARE IN uuf.
4. ON UNITS BELOW SER NO. 95 R-29 WAS 100 OHM, 1 WATT.
5. ON UNITS BELOW SERIAL NO. 200 C-54 WAS 10-50 uuf.
6. ON UNITS BELOW SERIAL NO. 215 R-70 NOT USED.
7. ON UNITS BELOW SERIAL NO. 215 R-32 & R-33 WERE 22K.
8. ON UNITS BELOW SERIAL NO. 215 C-48 & C-49 WERE 15 uuf.

Figure 7-1 17L-3 VHF Transmitter Schematic Diagram

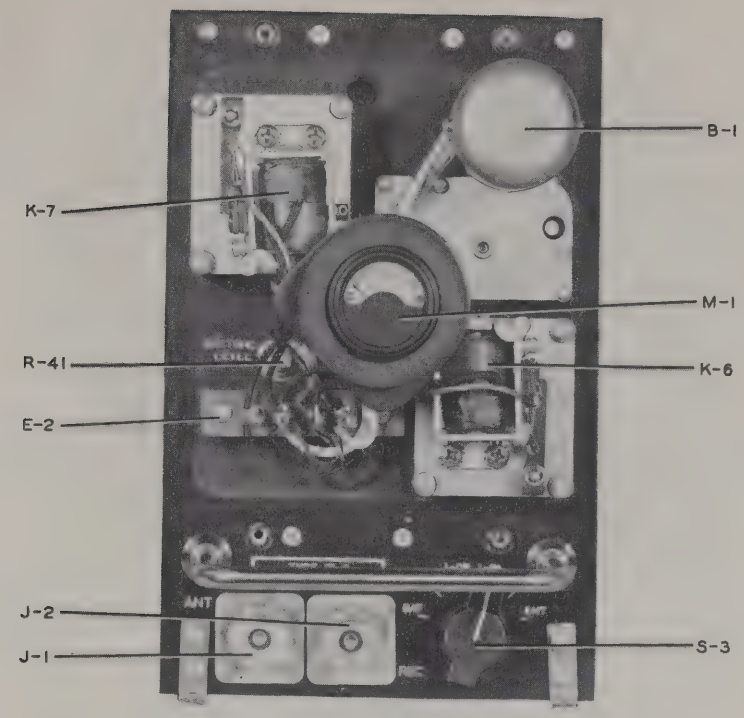


Figure 7-2 17L-3 VHF Transmitter, Parts Arrangement, Front View

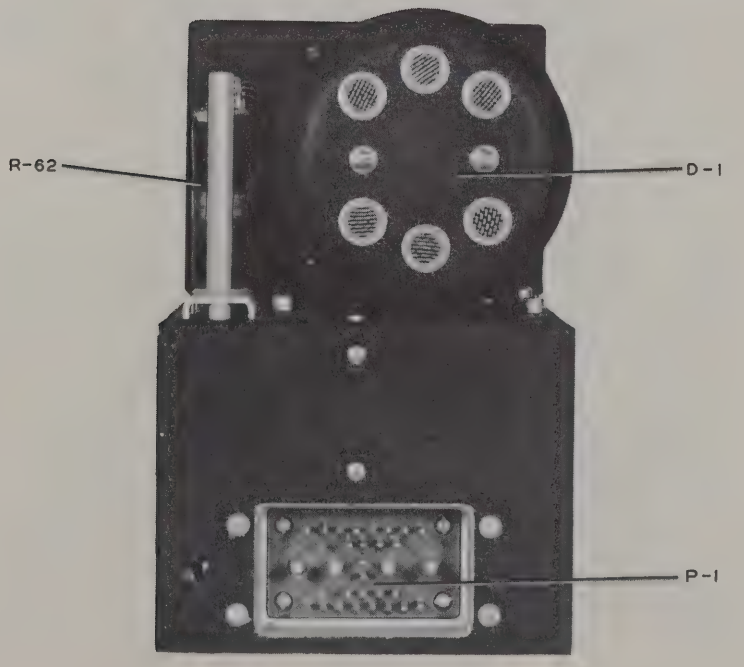


Figure 7-3 17L-3 VHF Transmitter, Parts Arrangement, Rear View

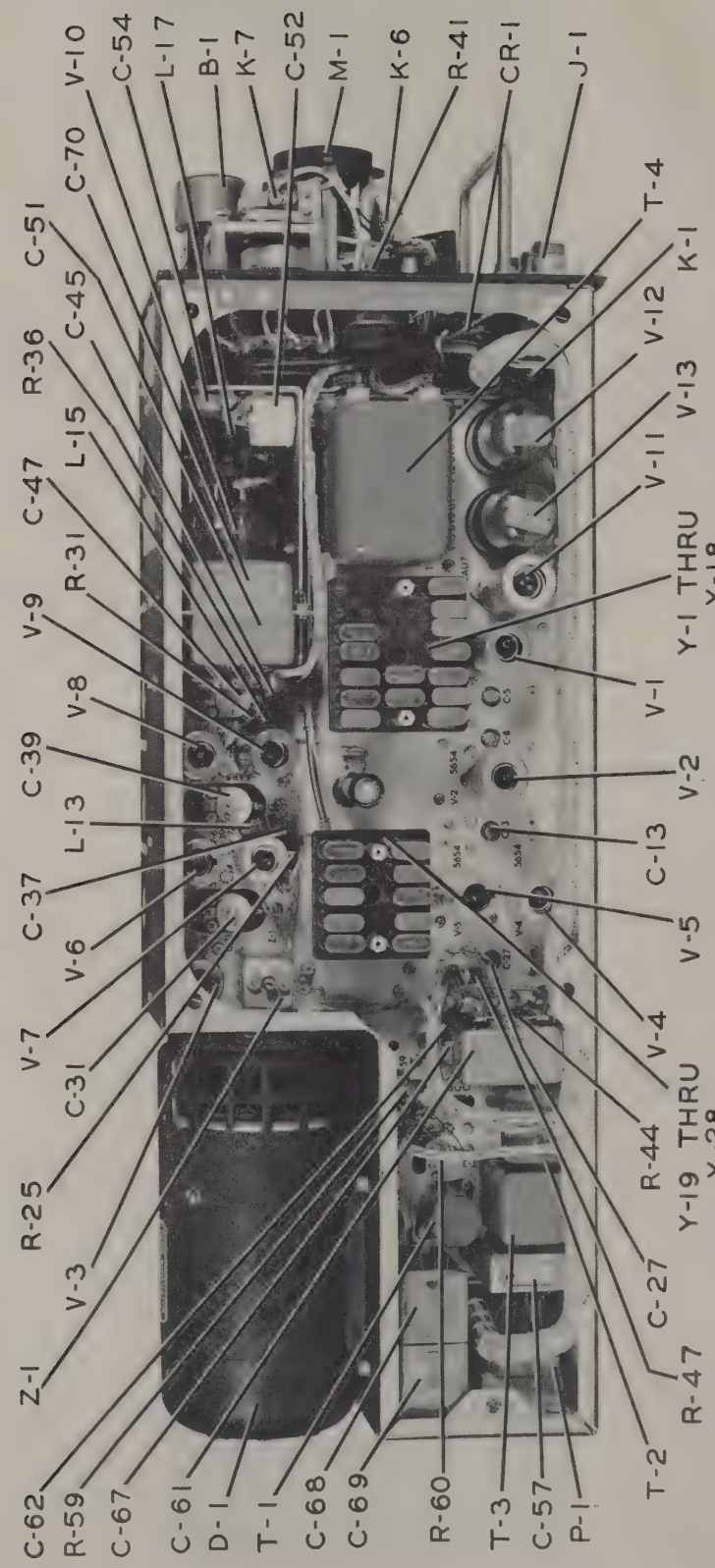


Figure 7-4 17L-3 VHF Transmitter, Parts Arrangement, Left Side View

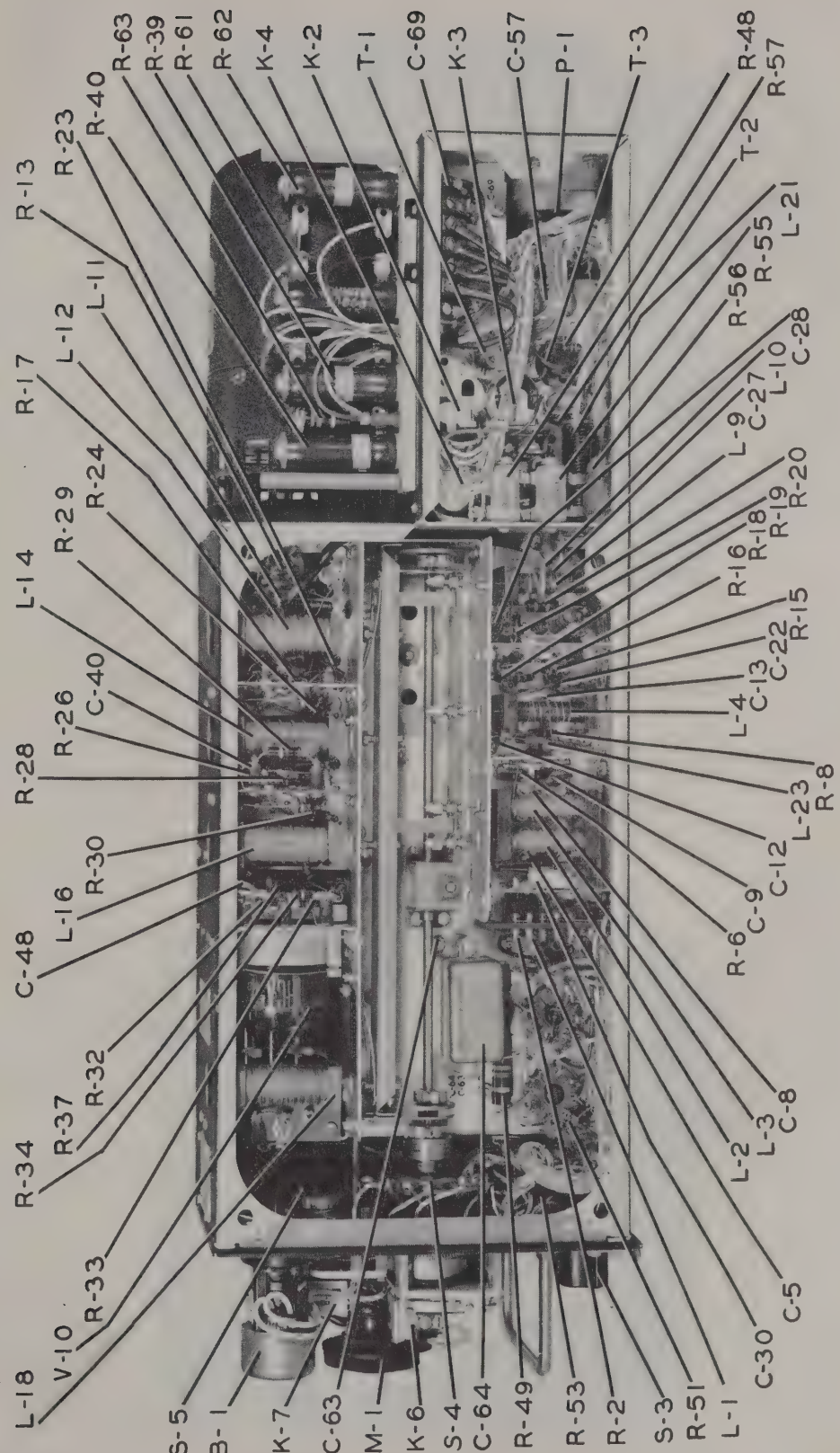


Figure 7-5 17L-3 VHF Transmitter, Parts Arrangement, Right Side View

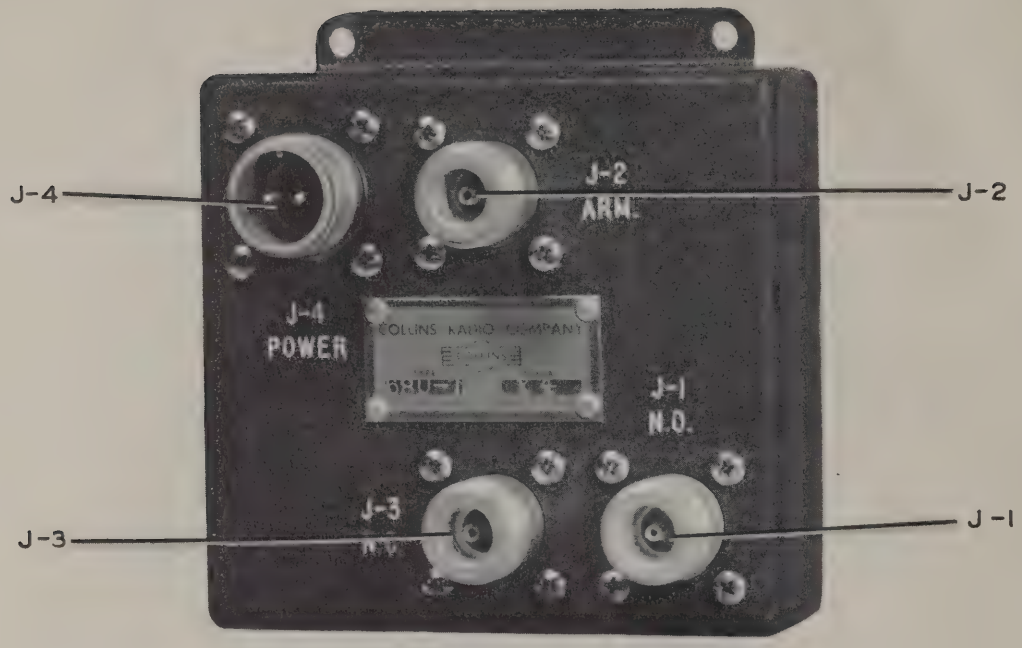


Figure 7-6 68U-1 Coaxial Relay, Parts Arrangement, Top View

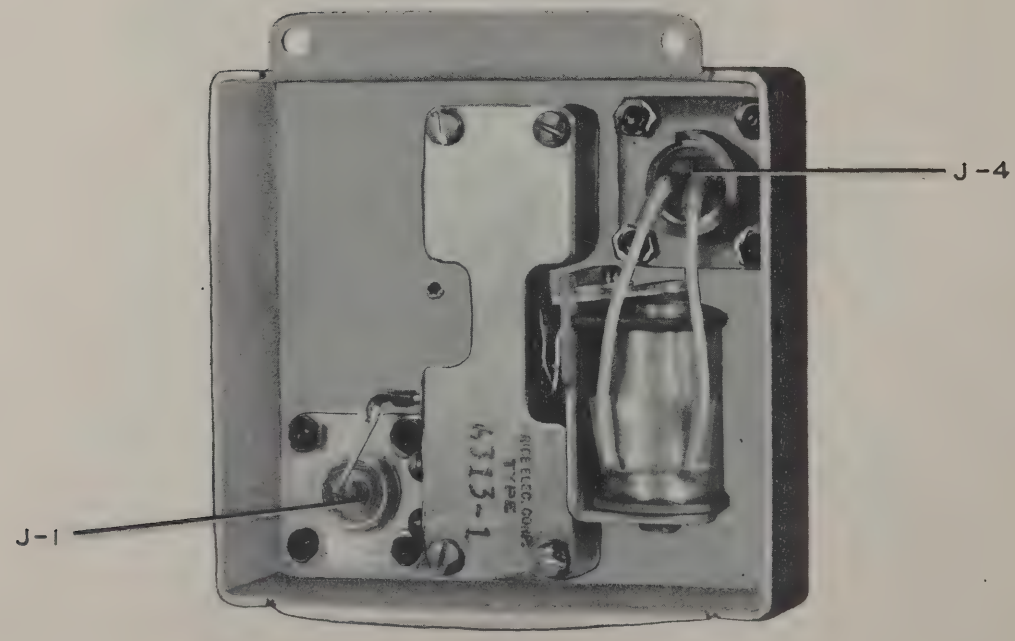
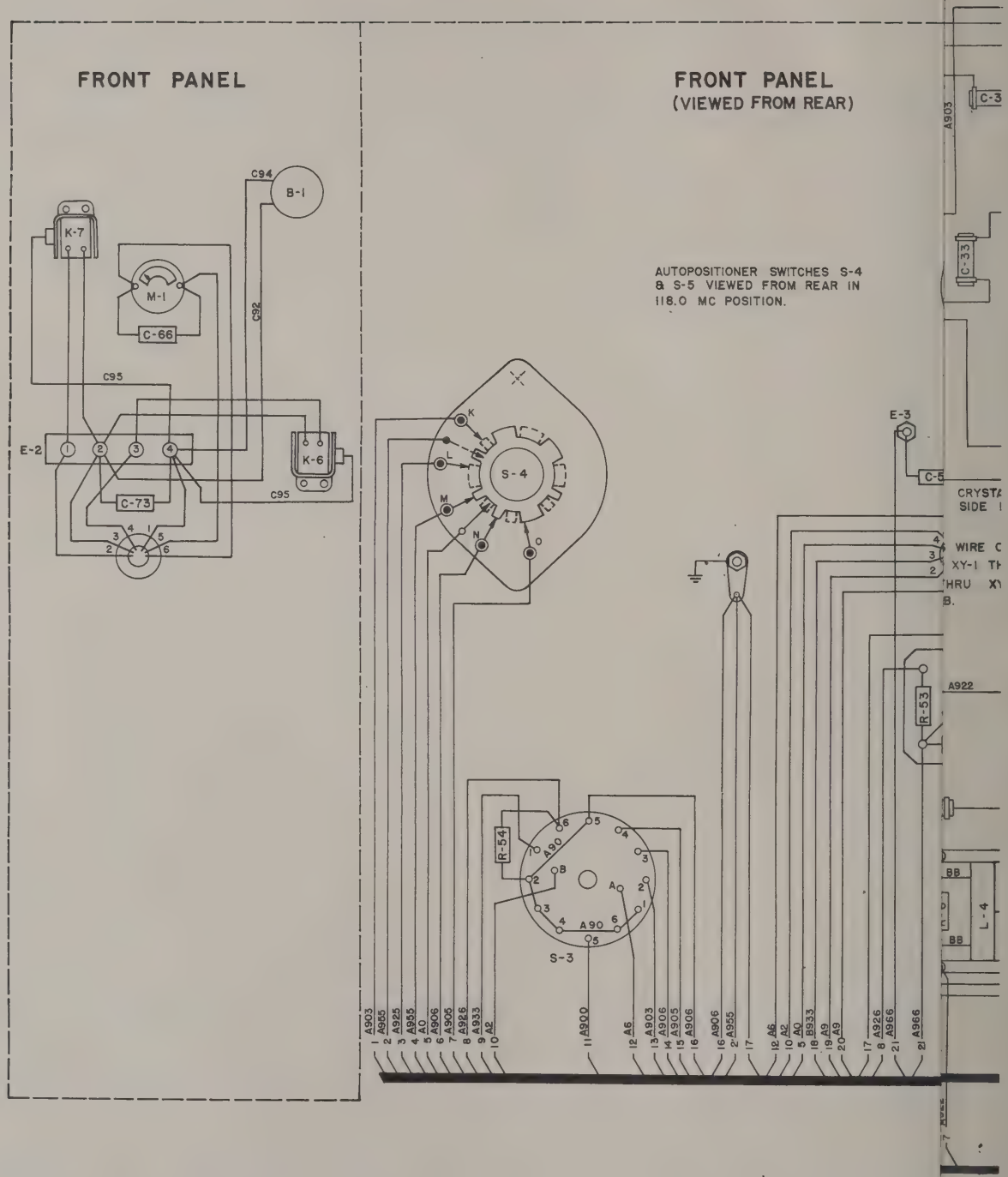


Figure 7-7 68U-1 Coaxial Relay, Parts Arrangement, Bottom View


FRONT PANEL
FRONT PANEL
(VIEWED FROM REAR)
AUTOPOSITIONER SWITCHES S-4
& S-5 VIEWED FROM REAR IN
118.0 MC POSITION.
B-1
C94
K-7
M-1
C-66
C92
C95
E-2
C-73
K-6
S-4
S-3
R-54
R-53
E-3
C-33
C-3
A903
A922
BB
L-4
A903
A925
A925
A955
A0
A906
A905
A926
A933
A2
A900
A6
A903
A906
A905
A906
A906
A955
A6
A2
A0
B933
A9
A9
A926
A966
A966

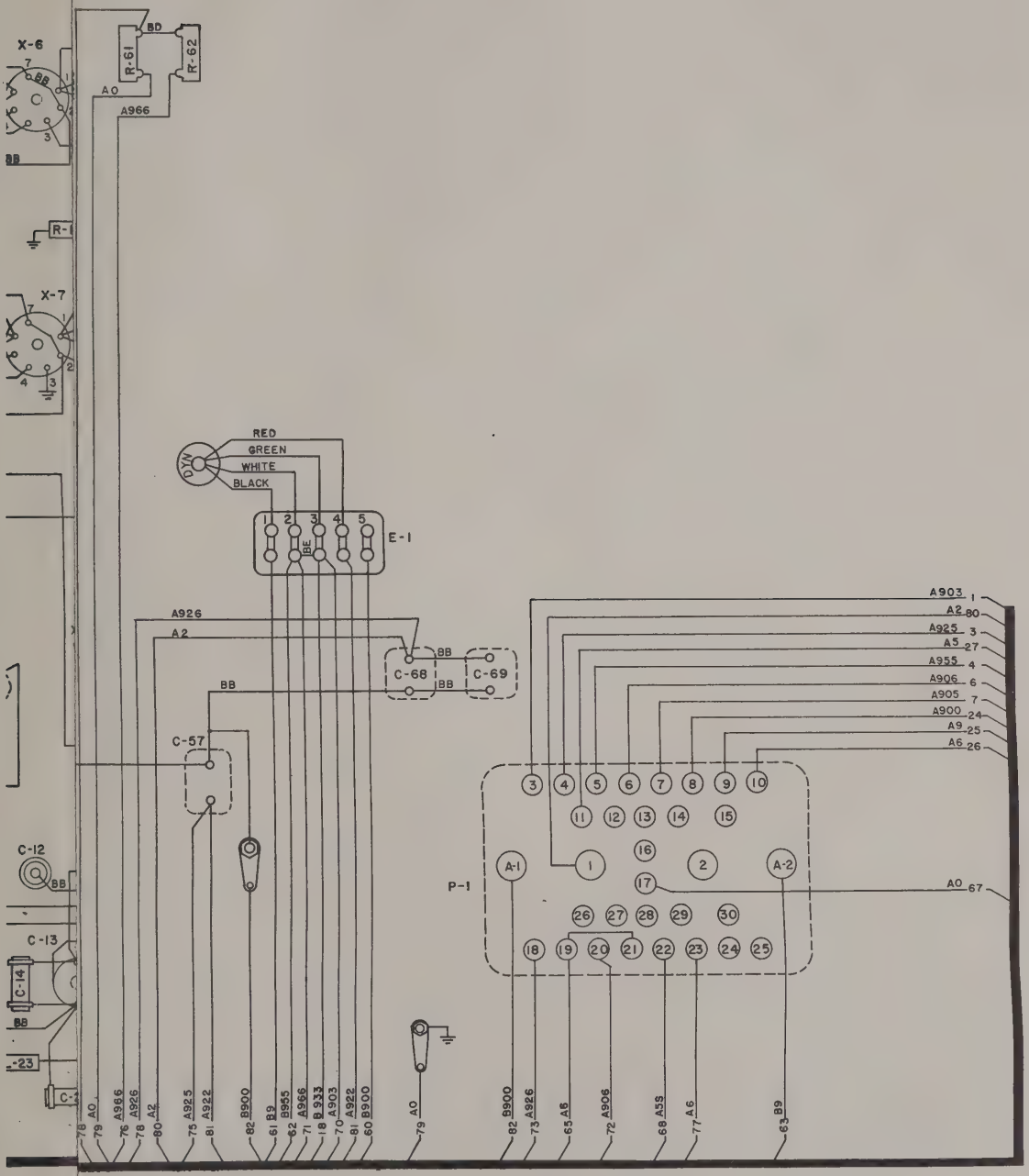
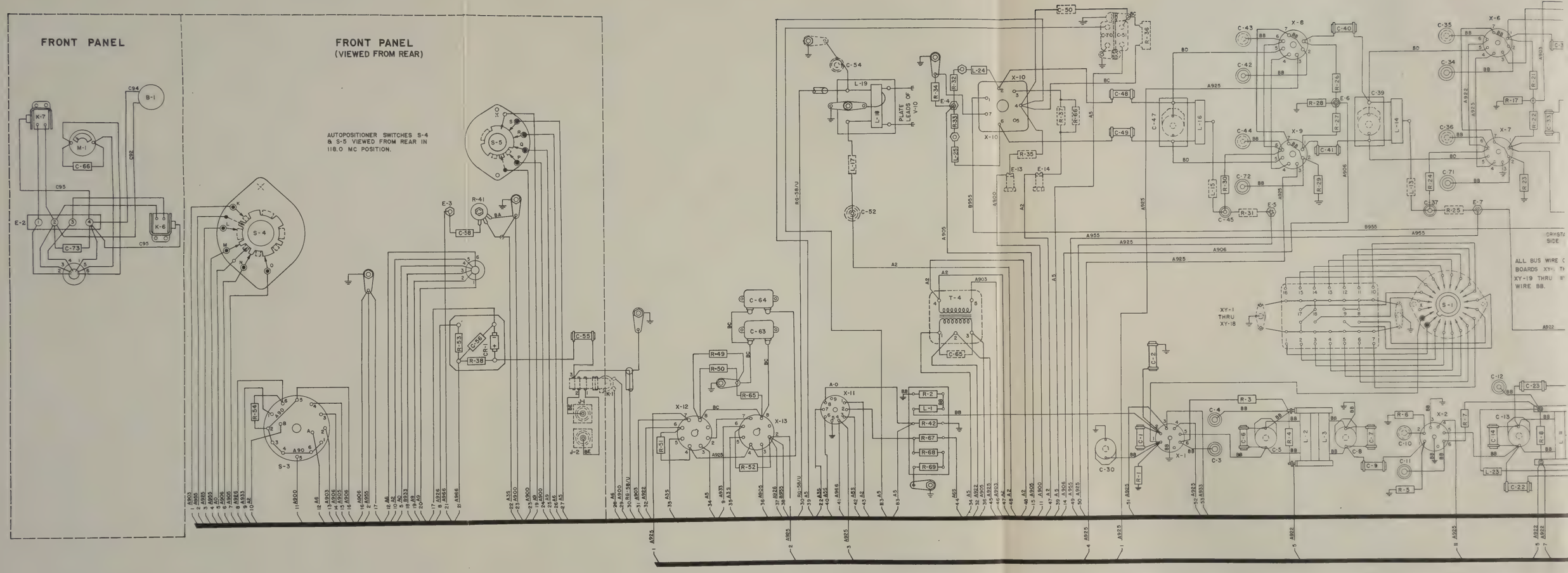


Figure 7-8 17L-3 VHF Transmitter Practical Wiring Diagram


FRONT PANEL
FRONT PANEL
(VIEWED FROM REAR)
AUTOPOSITIONER SWITCHES S-4
& S-5 VIEWED FROM REAR IN
118.0 MC POSITION.
PLATE
LEADS OF
V-10
ALL BUS WIRE C
BOARDS XY-1 T
XY-19 THRU
WIRE BB.
XY-1
THRU
XY-18

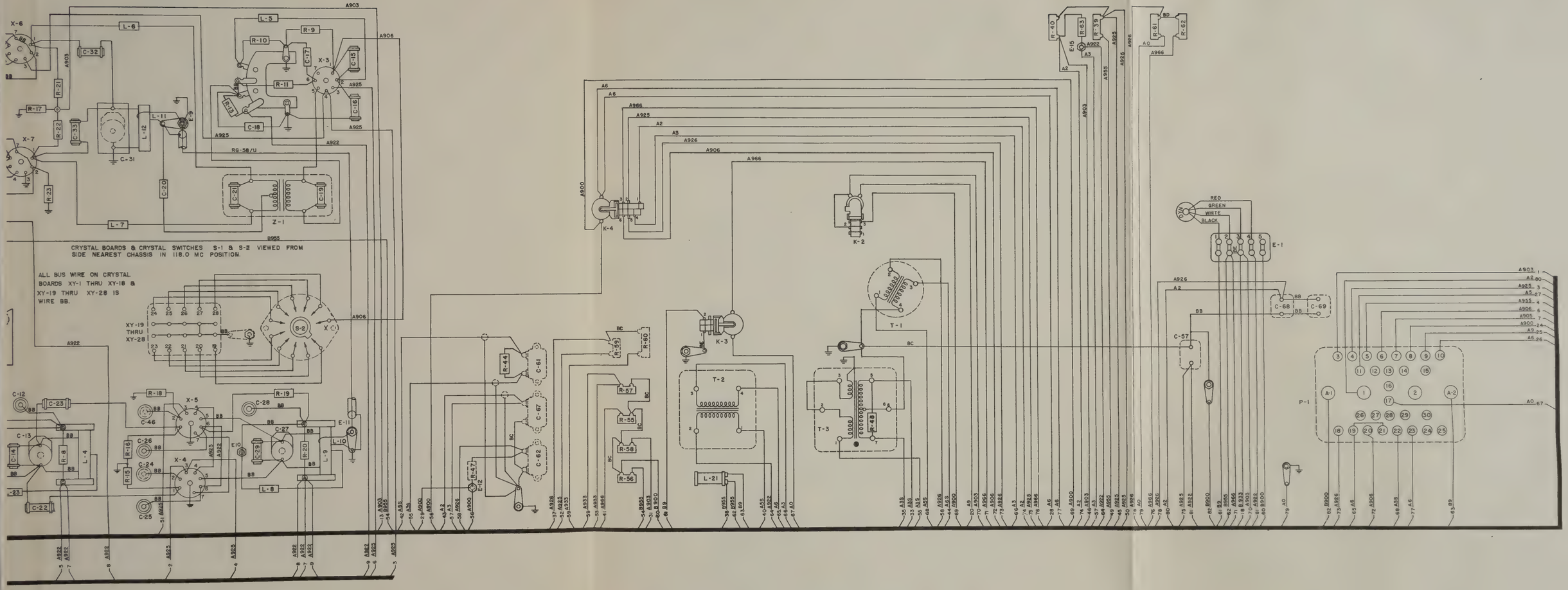


Figure 7-8 17L-3 VHF Transmitter Practical Wiring Diagram

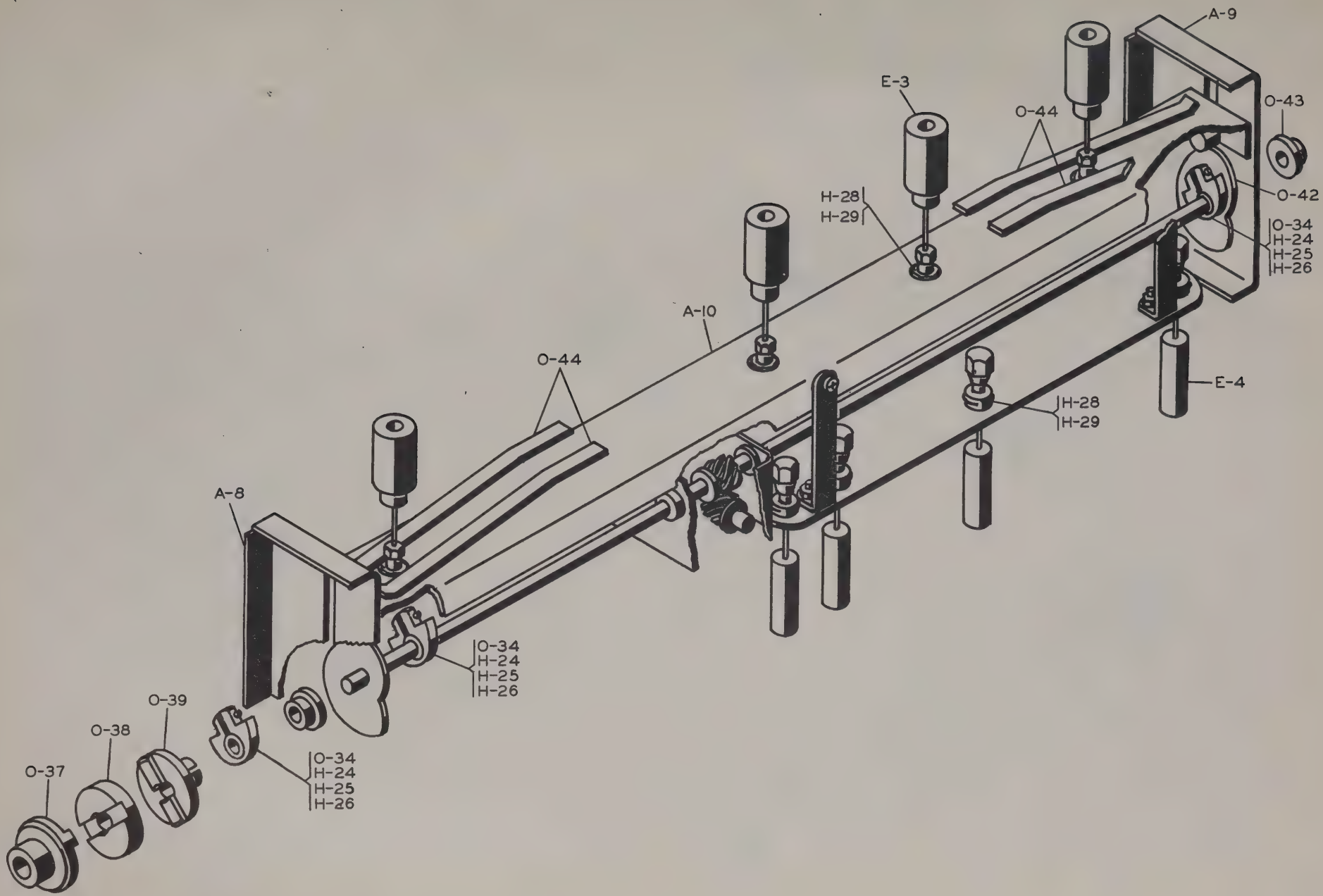


Figure 7-9 Exploded View - mc. Crystal Switching and Tuning Mechanism

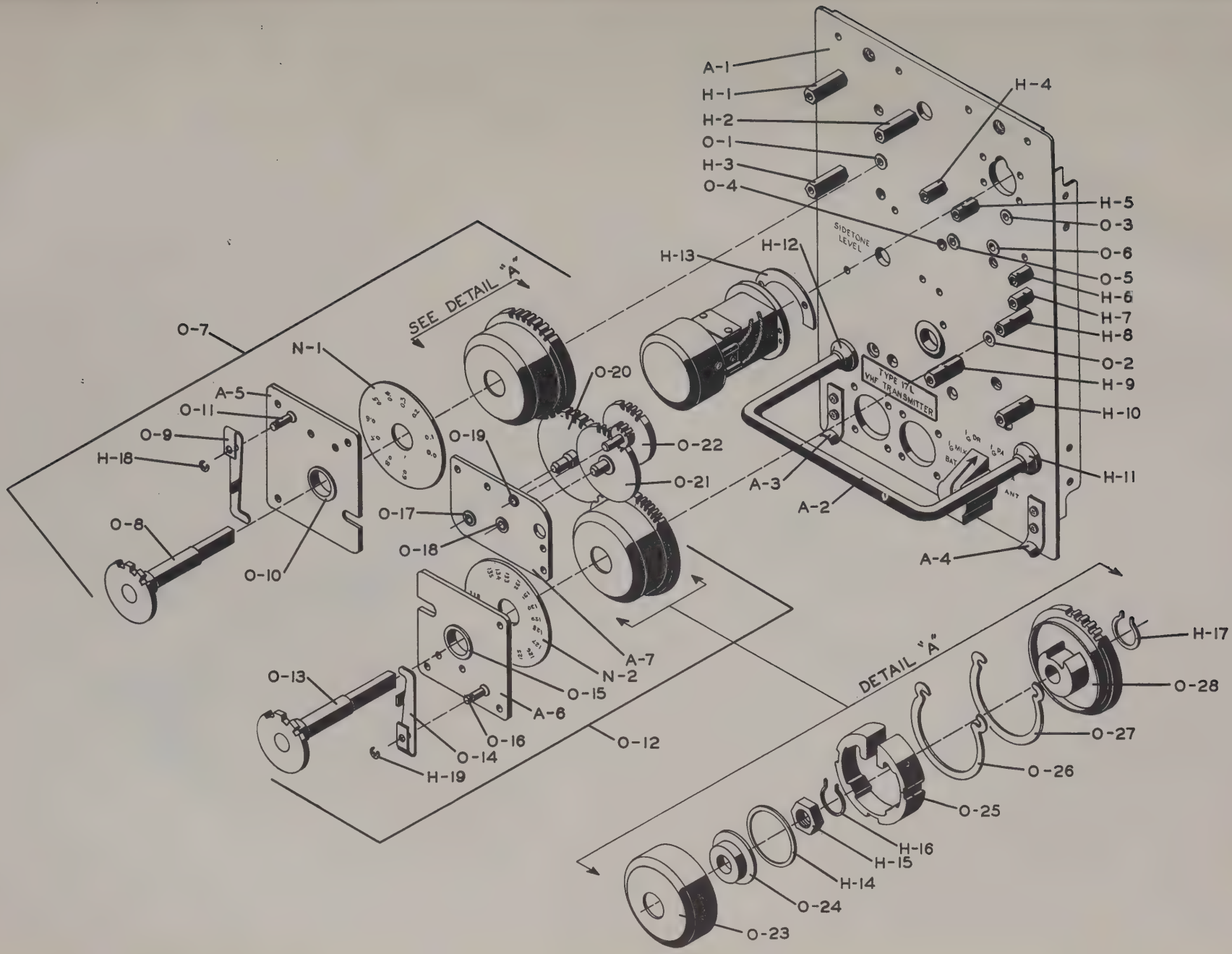


Figure 7-10 Exploded View - Autopositioner Mechanism

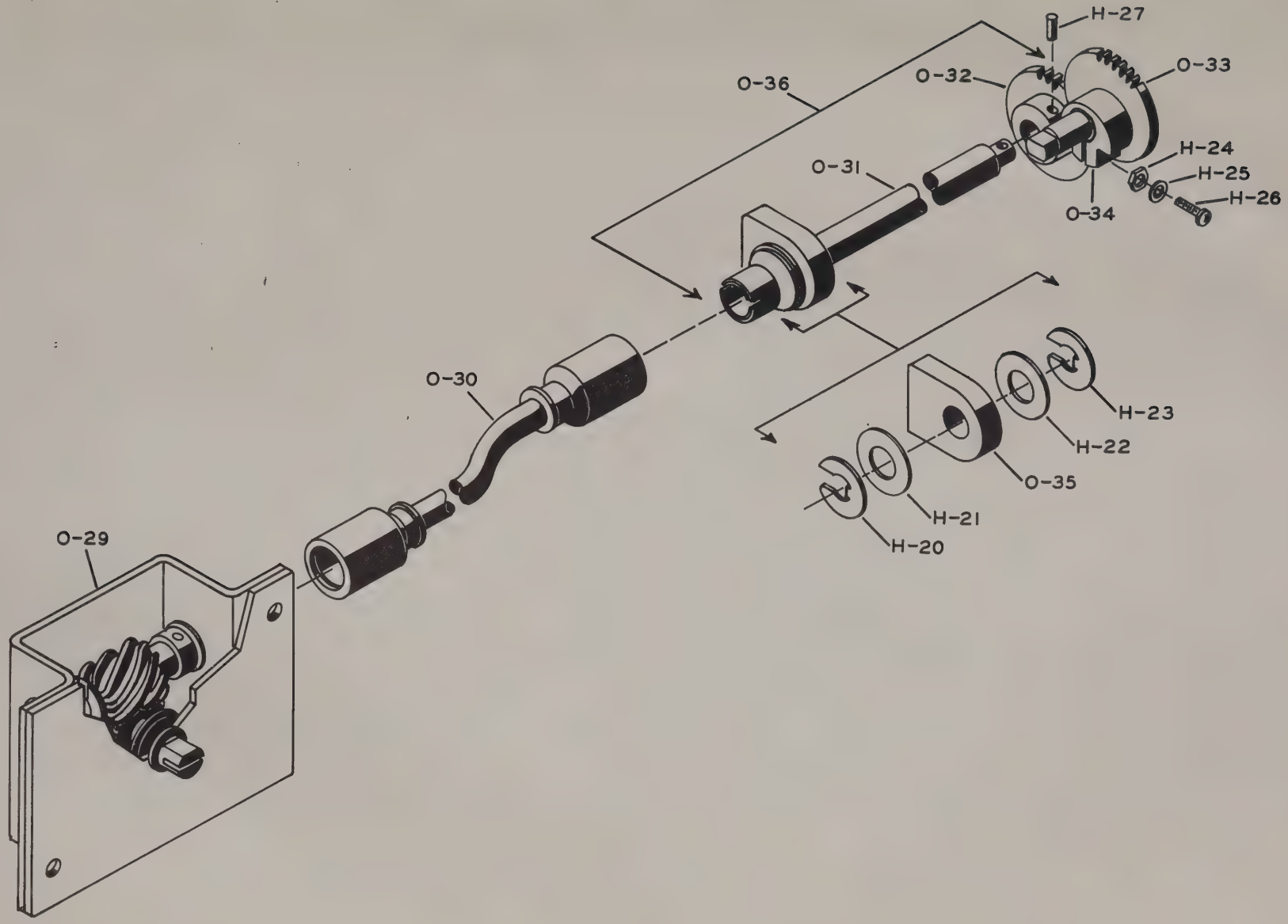


Figure 7-11 Exploded View - 0.1 mc. Crystal Switching Mechanism

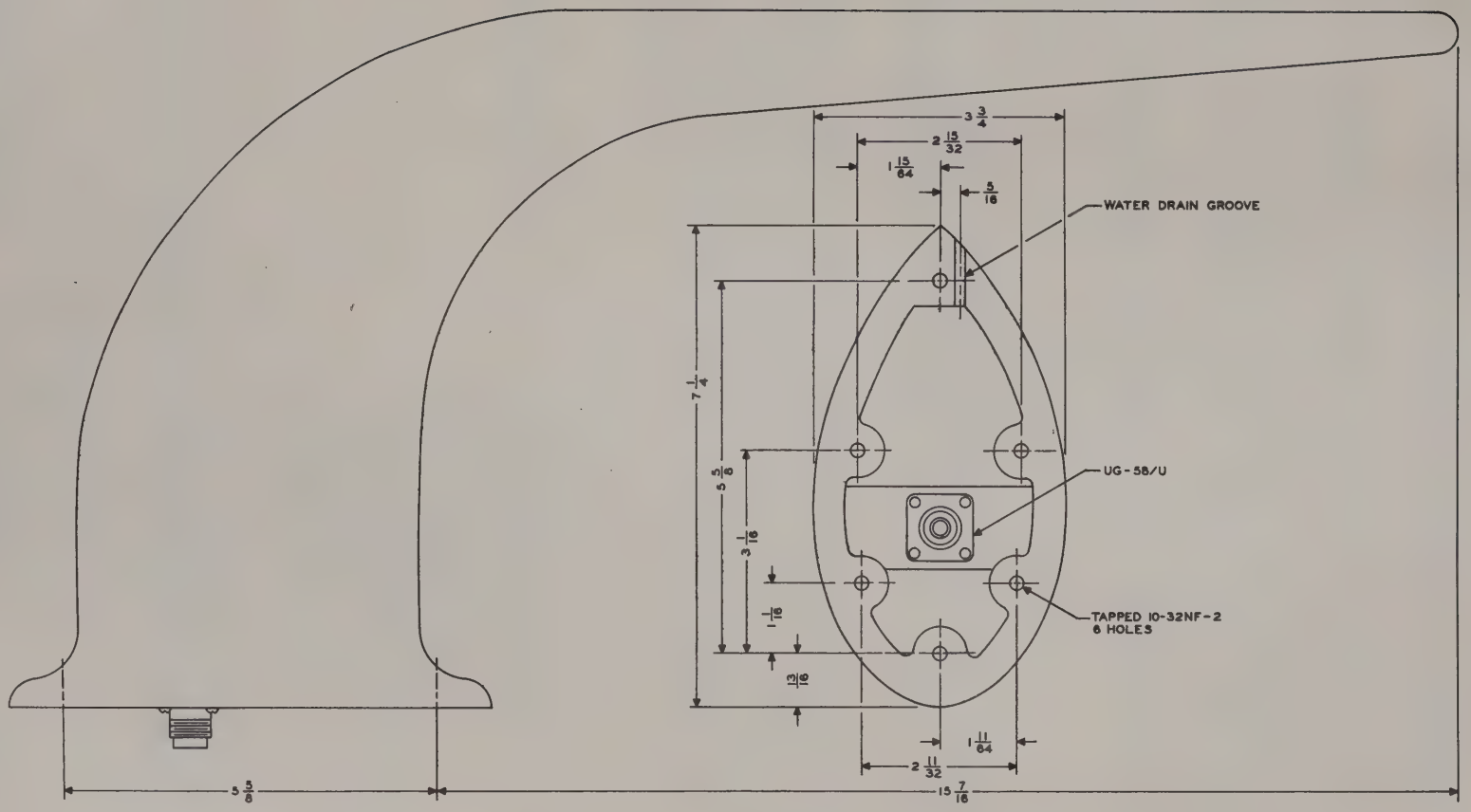


Figure 7-12 Installation Drawing - 37R-1 Antenna

GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

(a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.

(b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.

(c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

HOW TO RETURN MATERIAL OR EQUIPMENT.

If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

(A) Type number, name, and serial number of equipment
(B) Date of delivery of equipment
(C) Date placed in service
(D) Number of hours of service
(E) Nature of trouble
(F) Cause of trouble if known
(G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
(H) Item or symbol number of same obtained from parts list or schematic
(I) Collins' number (and name) of unit sub-assemblies involved in trouble
(J) Remarks

HOW TO ORDER REPLACEMENT PARTS.

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

(A) Quantity required
(B) Collins' part number (9 or 10 digit number) and description
(C) Item or symbol number obtained from parts list or schematic
(D) Collins' type number, name, and serial number of principal equipment
(E) Unit sub-assembly number (where applicable)

COLLINS RADIO COMPANY

MAIN PLANT:

855 35TH ST. N.E., CEDAR RAPIDS, IOWA

BRANCHES:

1930 HI-LINE DRIVE, DALLAS 2, TEXAS

11 WEST 42ND STREET, NEW YORK 36, N. Y.

2700 WEST OLIVE AVE., BURBANK, CALIF.